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Mathematics in composition:
A defense of Flesch's readability formula

by

Nancy Ann Vieth

A Thesis Submitted to the
Graduate Faculty in Partial Fulfillment of the
Requirements for the Degree of
MASTER OF ARTS

Department: English
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Iowa State University
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PREFACE

One topic kept coming up in my class work during the first year of my graduate study: readability. Although readability can refer to how legible handwriting or typography is, this study will refer to it only as a determination of the ease of understanding or comprehension due to the style of writing (Klare 1963, 1). A readability formula, then, would be a mathematical formula used to determine if a document could be comprehended by a given audience. In a world where thousands of dollars may be lost because of the wording of one letter or memorandum, it is vitally important that both the writer and reader of that document agree on its meaning. Therefore, readability is of major importance in my area of specialization, Business and Technical Communication. Yet the question of how to achieve that agreement between writer and reader is difficult to answer.

An example of the problems that can arise because of readability is a law suit many women have filed against A.H. Robins drug company, manufacturers of an intrauterine contraceptive device. Robins needed to send information to the women that stated the deadline for filing claims against the company. The judge for the case found that the information was "not in plain English and was appropriate mainly for lawyers. Robins agreed to revise the notice and promised to rewrite it at a 4th or 5th grade level" (Fry 1987, 341). In this case the women who might not have filed on time would be the ones to lose money because they could not understand the information from Robins.

Numerous studies have been done on how the size of type, the color of the paper, the number of words on a page, and other graphic considerations affect the ability of the reader to understand a given document (Tinker Legibility of Print 1963 and Crowel "Typography: a Technique of Making Text Legible" 1979). But the area of readability that is heard of most often deals with the length of sentences and the number of long words.

In 1943 Rudolf Flesch devised a mathematical formula using those two elements and the number of personal references to predict how readable a document is for adults. Although he was not the only person to devise such a formula, he is one of the best known figures in readability. His first book, The Art of Plain Talk (1946), became a best seller and introduced his adult readability formula to the general public.

He revised the formula into two formulas in 1948 and published another best seller The Art of Readable Writing. By 1977 he had published over fifteen books, had written even more articles, and had been a readability consultant for Associated Press. Yet in spite of Flesch's research and popularity, he is often criticized for what he had done. Many critics feel that Flesch's formulas and all other readability formulas are harmful to writers because the formulas cannot accurately predict difficulty, because the formulas cannot produce readable writing, and because the formulas have a negative influence on the teaching of business and technical writing. One of the major complaints is that the formulas focus too much on the product and not enough on the process of writing.

Perhaps it was my background in science and mathematics that made me feel a formula for readability was only logical. Or perhaps it was my sense of fair play that made me wonder if all the readability formulas in general, and Flesch's in particular, could be as bad as the critics claimed. In an attempt to justify my own beliefs and to answer my own questions, I started this thesis.

But before I could defend Flesch, or even know if Flesch was worth defending, I had to know how he devised his formula and what he claimed the formula could do. After a careful analysis of his work, I at least understood the basics. Using all the information that was available at the time, Flesch devised a formula that could predict how difficult a given document was for adult readers.

But now I had another problem. Exactly what type of research in readability did Flesch have at his disposal? Also, what was so unique about that time period that would inspire so many to do so much with readability in such a short time? (Nineteen formulas have been devised in less than twenty years.) Journal articles and books from the time period gave me the needed background.

Librarians and educators realized the need of providing appropriate reading material to people of various reading levels. All fourth grade students cannot read at the same level even though they are in the same grade, and all adults cannot read at the same level just because they are adults. People in charge of reading needed some way to determine the readability level of written texts so that they would know if a given

audience could understand it. Before Flesch created his formula, the majority of formulas had dealt with reading material for children.

But during the 1930s, adult education became an important concern among educators and librarians. More adults than ever wanted to read and needed books that they could understand. Because of the push in adult education, Flesch wanted a formula that would work for a general audience of adults. After he had worked out a formula, Flesch published his findings in the best-selling books The Art of Readable Writing and The Art of Plain Talk.

So now I knew how and why Flesch did his work and what he had based his work on. From my class work, it appeared that there was a strong movement against readability formulas in general and against Flesch in particular since his work is so well-known. But now I needed to know exactly what the critics and supports of formulas were saying. How widespread was the criticism and, knowing what I did about Flesch, were any of the criticisms justified?

After more research, I was surprised at what I found. Of seventy-five journal articles, eleven were against formulas but only five of those nine stated that formulas should never be used (Battison and Goswami 1981; Bruce, Rubin, and Starr 1981; McConnell 1983; Selzer 1981; Stevens 1980). Two of the eleven stated that formulas did not work for literary prose but might be useful in other areas (Rygiel 1982; Williams 1984); one stated that formulas did not work when the audience was non-native American or disadvantaged (Drury 1985); one stated that formulas might be useful in other areas but did not work with technical

writing (Plung 1981); and the last two stated that formulas should not be used as a revision technique (Lynn 1984; Redish 1981).

Of even more interest was that all the articles agreed on several points whether they were against formulas or not: formulas are not absolutes, formulas cannot measure all areas that might affect readability, and formulas may be misused by some people. Whether or not authors agreed with readability formulas seemed to depend on how perfect they expected the formulas to be. Authors who were willing to accept the formulas as only yardsticks of readability were more willing to use formulas. Authors who wanted formulas to do everything from predicting readability to revising text were more likely to discredit formulas. I was still faced with the question of whether or not the critics were justified in what they said.

If I wanted one author as an example of a critic of readability formulas, Jack Selzer seemed to be the only choice. Selzer covers most of the criticisms against formulas and other authors refer to his article as "an excellent overview" (Lynn 1984, 140) and "an excellent summary of the criticisms or readability indexes" (Bogert 1985, 11). I decided to take the points listed in Selzer's article and go through Flesch's dissertation again, paying particular attention to the areas that Selzer disputed.

Again I was surprised. Selzer's criticisms seemed to echo the limitations Flesch himself had placed on his formulas when they were first devised. Flesch knew that the formulas could not measure every aspect of readability, that a reader who was highly motivated or

interested could read more difficult material, that the formulas should not be used on literary prose, and that word length and sentence length did not cause difficulty.

Selzer's claim that formulas cause style to be ignored in business textbooks did not appear to be logical. The formulas cannot be blamed if textbook authors use the formulas incorrectly. Flesch never stated that the formulas could produce readable writing by themselves. Although he did state writers should use short sentences and short words, he also stated that there were many other considerations including white space, transitions, and the background of the reader. All of his books for the general public give detailed instructions on how to produce readable writing; the formulas are applied after the rules have been followed. Also, Flesch wrote entire books dealing with writing style (How to Be Brief 1962, Say What You Mean 1972, A Deskbook of American Spelling and Style 1977). He never stated that the only things a writer needs to worry about are sentence length and word length. He also knew how important the audience and purpose are; writing to a given audience is why he devised his formulas in the first place.

Also, I was not as certain as Selzer that most business and technical textbooks relied either directly or indirectly on readability formulas. More research was required. I went to the Parks Library at Iowa State University and surveyed all the textbooks in business and technical communication that were on the shelves on a given day. I also surveyed the books that I had received as review copies in 1986-7.

Of the sixty-one textbooks I examined that were published from 1940 to 1987, only ten listed readability formulas in their indices (Bovee and Thill 1986; Carosso 1986; Damerst 1972; Emberger and Hall 1955; Harty and Keenan 1987; Michaelson 1986; Stout and Perkins 1987; Turk and Kirkman 1982; Weisman 1972; Wirkus and Erickson 1972). The first reference to readability formulas was found in a 1948 textbook by Kerekes and Wilfrey (48). Almost all of the remaining texts discussed areas of style to some extent.

Again, Selzer's claims do not prove to be correct. The trend to ignore style in textbooks is not new. There also does not seem to be a major change in how style was handled from the early text to the present. If anything, the more recent texts contain more information on style (Bovee and Thill 1986; Lannon 1985) than the early texts did. If the books written before Flesch devised his formula do not contain information on style, then formulas cannot be the cause. The causes could be the basis for another thesis.

Now that I had researched readability, textbooks, and articles, I was ready to write my defense of Flesch's work. Chapter One gives general background information about the time period and why there was any interest in readability. Chapter Two discusses what was happening in readability and the formulas that were in use when Flesch devised his formulas. Chapter Three is an analysis of Flesch's work and his readability formulas. Chapter Four looks at textbooks and articles that deal with readability.

CHAPTER ONE

Introduction to Thesis

General background

Readability is a major concern in business and technical writing. Since millions of dollars or even someone's life can depend on how well a document is understood, writers in many fields need to know if their documents are comprehensible by their intended audiences.

There is serious interest in readability on the part of manufacturers concerned about safety, product liability, and proper product use. . . . The insurance industry is also a prominent user of readability formulas. As of March 1984, 28 U.S. states required that personal auto and homeowners' policies must have a Flesch Reading Ease Score . . . [of] about a 10th grade level . . . Readability formulas are used on CPA accounting standards, computer programs, and customer information in nearly every industry. (Fry 1987, 339-40)

Many women have filed a law suit against A.H. Robins drug company, manufacturers of an intrauterine contraceptive device, because of a problem with readability (see Preface for a complete discussion of this case).

Major journals in the field of technical communication have responded to this concern by devoting large sections and even entire issues of their journals to the subject of readability. In March 1981 IEEE Transactions on Professional Communication had a forum for articles concerned with readability "comprised of six essays, both pro and con, on

the use of readability formulas. They provide background on the more common formulas and explore their general limitations" (editor's note, 43). In the same year, Technical Communication devoted an entire issue to readability.

Other areas of communication have also shown their concern with in readability; Teaching English in a Two Year College has devoted an entire issue to readability (Winter 1984). Yet, journal articles on readability can be found not only in business and technical writing and advanced composition but also in reading (Journal of Reading Vol. 30, Dec. 1986), psychology (Journal of Educational Psychology Vol. 74, 1982; Journal of Applied Psychology v. 32, 1948), physics (Physics Teacher 1979, 1980, 1983), and advertising (Advertising and Selling 1947). But authors of journal articles are not the only ones interested in readability.

Government, insurance, Medicare, and the military are interested in readability because they all rely on written communication. For example, the military needs manuals its enlisted personal can read and understand (Kniffin 1979), and Medicare has lost court cases because experts determined the letters written by Medicare were unreadable (Fry 1987, 341). Others are also interested in readability.

several states require easy-to-read lease agreements . . .

Real-estate, labor, and other legal contracts have been reexamined for their readability. . . . Even the Internal Revenue Service (IRS) is experimenting with individual tax form presentations and the Flesch Readability Index to see of schedules and instructions can be made more readable. . . . In

sum, an evolutionary expansion of the Bill of Rights is incorporating an eleventh right: the right of consumers and taxpayers to understand what they read. (Karlinsky and Koch 1983, 57-8)

One of the primary ways of predicting the readability of a document is with the use of readability formulas, mathematical equations used to predict how well a document will be comprehended by a given audience. Although the first formula for predicting the readability of material for children was devised in 1923 (Klare 1963, 30), possibly the most well-known formula was one devised for adult materials by Rudolf Flesch (1943b). Klare states that Flesch's first formula "was destined to become one of the best-known in the history of readability" (1963, 56). Karlinsky and Koch add that

Typically, the Gunning Fog Index or the Flesch Readability Formula is used to measure the readability of a given document. . . . The National Association of Insurance Commissioners adopted "The NAIC Model Act" . . . as a guide to state legislatures in regulating insurance company policy language. It specifically recommends the use of the Flesch Readability Index. (1983, 58)

Flesch felt that the public had the right to use his formula and published it and guidelines on writing in his book The Art of Plain Talk (1946). He subsequently revised the formula, splitting the one formula into two: one for predicting reading ease and one for predicting human interest. The new formulas were published in another book, The Art of

Readable Writing (1949b). Klare states that "Prior to Flesch's time, readability was a little-used word except in educational circles, but he made it an important concept in most areas of mass communication" (1963, 56). By 1977 Flesch had published over fifteen books, had written even more articles, and had been a readability consultant for Associated Press and others.

As with anything that has become popular, readability formulas have attracted critics. Because the formulas are popular and well-known, Flesch's seem to be mentioned most often by the critics. To determine how wide spread the criticism is, I conducted a survey of journal articles. I started by checking the reference sections of journal articles I had received in several classes I had taken in business and technical communications (Bogert 1985; Karlinsky and Koch 1983; Selzer 1981). I tried to pick articles that dealt specifically with Flesch's formulas, although that was not always possible. Next I looked through all the issues of several business and technical journals (including Journal of Business Communication, IEEE Transactions on Professional Communication, Technical Communication, and Journal of Technical Writing and Communication) to find any articles that might not have been mentioned in the reference sections of articles I already had copies of.

Out of seventy-five journal articles from a wide variety of fields (including education, physics, reading, psychology), fourteen supported formulas and only five stated that readability formulas should never be used (Battison and Goswami 1981; Bruce, Rubin, and Starr 1981; McConnell 1983; Stevens 1980; Selzer 1981). Even more surprising was the consensus

of the rest of the authors. They all felt readability formulas could provide useful information if, and only if, they were used as a means of predicting the comprehension level of a piece of non-literary prose. Formulas should not be used as a way to produce readable prose, but rather as a means of checking what had already been written.

One of the most outspoken critics of readability formulas is Jack Selzer. Selzer covers most of the criticisms against formulas in his article and other authors refer to his article. Yet Selzer attacks formulas as if they were intended to be magic cure-alls for all areas of writing from composing documents to determining how difficult they are. As I shall show, many of his complaints against formulas were listed as limitations on the formulas when they were first devised.

But Rudolf Flesch never intended for his formula to be the last word in readability or to be indiscriminately applied to all types of writings. He also knew that the formulas should not be used by themselves, but that they should be used in conjunction with basic rules for clear, concise, and interesting writing. All of his books give detailed instructions on how to produce readable writing; the formulas are applied after the rules have been followed. Also, Flesch wrote entire books dealing with writing style (How to Be Brief 1962, Say What You Mean 1972, A Deskbook of American Spelling and Style 1977). He never stated that the only things a writer needs to worry about are sentence length and word length. He also knew how important the audience is; he devised his formulas so that a given audience could know what documents they could understand.

Premise

Although critics present evidence against all readability formulas, it is not the formulas that are at fault but how the formulas are used. By providing a detailed description of the time in which Flesch worked, the formulas that were currently in use, and Flesch's work and his formulas, I hope to prove that Flesch's readability formulas do not create problems. Rather, the problems are the results of people who have misused readability formulas.

Before I can present a complete case in favor of Flesch's readability formulas, the reader needs background information on what readability is, the time period in which Flesch devised his formula, and why Flesch was interested in readability. The Chapter Two gives background information on what had been done in readability before Flesch, Chapter Three details Flesch's work and his formulas, and Chapter Four takes a longer look at textbooks and journal articles.

Readability defined

Readability measures the ability of an audience to understand the information provided by a written document in the way that the author intended. Writers strive for readable documents so that the audiences will respond the way the writers want them to when the document is read (Klare 1963, 11). Thus, "The book is on the table" is readable because the reader can easily understand what the writer is saying. On the other hand, the following is not readable unless the reader can understand the terms and process the writer is talking about.

The basic 2858 x 61 data matrix thus generated was converted into the 61 x 61 correlation matrix, consisting of the Pearson 'r's. This correlation matrix was then factor analyzed by means of the principal components method, using unitities in the diagonal. (Quereshi 1981, 143)

Although readability can refer to how legible handwriting or typography is, this study will refer to it only as a determination of the ease of understanding or comprehension due to the style of writing. A readability formula, then, would be a mathematical formula used to determine if a document could be comprehended by a given audience.

George Klare has done an extensive study of readability in The Measurement of Readability (1963). He refers to readability formulas as a method of measurement intended as a predictive device. The design of the method and the intention of the writer must have been to provide quantitative, objective estimates of difficulty for pieces of writing without requiring readers to take tests of any kind on them. Furthermore, the method must be general enough to provide estimates over a range of applicability and of difficulty, i.e., be more than a procedure set up to compare only a few specific books, especially those within a given school grade. (emphasis Klare's; 33-4)

Klare's definition is important because it emphasizes that readability formulas should only be considered as a means of predicting readability. Flesch and others who devised formulas consistently stress that there are too many factors involved in readability for one formula

to accurately determine the readability of a document for all readers (Flesch 1943b, 38; Lorge 1944a, 407). Such things as the reader's purpose and background cannot be measured and yet they do affect how a reader will understand a document (Lorge 1944a, 404; Klare 1963, 11).

Now that we know what readability is, we need to take a look at the way readability was used in the early 1900s so that we can understand why Flesch and others worked on readability.

Adults in the early 1900s

Adults in the early 1900s were caught in a trap. Many could not afford the costs of college or even high school; the only way they could gain an education was to read on their own. The American Association for Adult Education was established in 1926 to coordinate the studies in the then new area of adult education and to provide mutual assistance to those involved. A grant from the Carnegie Corporation funded the Association (Cartwright 1935, 16-18).

The Association's director, Morse Adams Cartwright, knew that there was no simple answer or one way to help all adults. Each individual and each adult education program had to be specially designed for that individual or program. Adult learners could not be placed together in one general category since they all had different interests and reading levels (1935, 42).

So, where did this leave the person interested in helping with adult education? First of all, the interests of the adults being educated needed to be determined. Then materials would have to be produced that would fill the needs and interests of those desiring the education.

Reading interests Several major studies of the interests of adult readers and of what they actually read were done in the 1920s and 1930s. The most extensive study was done by Waples and Tyler in 1931. They found that "adult members of all classes are interested reading about significant social issues" (Anderson 1940, 244). Another study that Waples did in 1932 was more specific.

Men and women want to read about laws and legislation, international attitudes, preparedness, prices and costs of living, science and warfare, prevention and treatment of specific ills, analysis of personal qualities, travel and outdoor life, successful marriage, the next war, interesting places in the United States, interesting people, adult education and the use and abuse of reading, but they do very little reading in these areas. (Anderson 1940, 245-6)

Waples' readers sound much like people today. We are interested in the world around us, how we fit into it, and what we can do in it.

Another study was done by Gray and Leary in the early 1930s. Their study gives us addition information as to why people were interested in readability.

With the New Deal committed to the policy of using its powers to alleviate economic distress, adult education is being utilized as an important step toward recovery. . . . In the majority of cases adult students are being guided to find a way out of an economic situation they but partly understand. . . . Readers at all levels of learning are asking for more

information about their own vocations and professions--
information that will add to their efficiency and tend to
create in them a feeling of security. (1935, 2-3)

Adults were given an opportunity that they had never had before. Not only did they want to learn, but the government was willing to help. Yet the adults interested in learning wanted more than the security that had been missing during World War I and the Great Depression; they wanted information so that they could make decisions on their own and not have to rely on government to make all the decisions for them.

Materials presenting reliable information on current economic, social, and civic problems are being sought not only by the economist and sociologist but by the ordinarily indifferent layman who has come to want something more than passing propaganda on which to base his hopes and his decisions. (Gray and Leary 1935, 3)

However, other studies had found that adults seldom read material on current issues. Waples did further studies in 1932 to discover the relation between what readers actually read and what they wanted to read. Readable, or what Waples calls "congenial," writing on subjects of interest were scarce. He found that "readers of limited education who are interested in specific problems of economics or science can seldom find such subjects authoritatively treated in language that is clear and in a style that is pleasing" (quoted in Anderson 1940, 245).

The lack of accessibility was another problem. "Readers of wide education . . . are satisfied neither by the superficial scraps in

newspaper columns nor by the technical treatises . . . They want something in between" (quoted in Anderson 1940, 245).

Another key point was the different areas that the public was interested in.

Recent studies of subject interest among readers have shown clearly that many of the subjects of most interest to certain groups are not represented in actual reading because congenial writing on the subjects is scarce. . . . Magazine articles are too fragmentary for some readers interested in subjects that are treaded almost exclusively in magazines, whereas books are too ponderous for other readers interested in subjects that are almost exclusively treated in books. (quoted in Anderson 1940, 245)

So, how could the majority of adult reading material be so far off from what adults wanted to read or were able to read? What characteristics distinguished the majority of adult readers and how well could that majority read?

Adult reading levels Government became involved in readability with the New Deal. It wanted to educate adults, and adults had the free time to learn. The work day and work week had been shortened, and unemployment and the continuing economic crisis created more leisure time in which people could read (Gray and Leary 1935, 2). Yet there was still one major problem. The majority of adults could not read well.

Gray and Leary stated that approximately "50 per cent of our population cannot read with ease and understanding much of the reading

material now available for adults" (1935, v). Lyman Bryson, director of the Readability Laboratory, paints an even bleaker picture. Educators had to realize that

first, the fact that most of the adult population of this country have had less than an eighth grade education; second, that . . . they received imperfect training in reading; and, third, that most of the serious books now in print mean nothing to them. (1937, 397)

Clearly, research needed to be done so that a way could be found to match the low reading level of adults with new documents containing the material they were interested in. Also, writers needed a way to check what they wrote to see if it would be readable for those adults who could not read well. Was it possible to devise something that could be used to test materials that were already available and also to help writers provide new, easy material?

Libraries William S. Gray credits librarians as the first group to become interested in readable books. Even before adult education had become a major interest, librarians had constantly been asked to locate books that were suitable for a given reader (1937, 235). Librarians continued to play an important role in adult education since their chief concern was adults and what they read.

Because of this concern, the New York Public Library opened the Readers' Advisory Service in March 1929. By 1934, forty-eight libraries around the nation offered advisory services. The purpose of the Advisory

was to help adults find suitable books to fill their individual needs by providing them with reading lists.

Each individual was first interviewed; "clues are sought to his educational background, cultural interests, and special training. . . . All that can be discovered about past reading of books and magazines is noted" (Flexner and Hopkins 1941, 21). Then lists were prepared using similar lists which had already been prepared and a "vertical file which contains copies of lists made for other readers and subject bibliographies collected from many sources. For further suggestions, the annotated subject catalogue is consulted . . ." (Flexner and Hopkins 1941, 22).

However, the Advisory ran into problems because no one adviser could know every book in the library. Although the advisers could rely on feedback from readers on how well a particular book suited them, they still needed to spend a great deal of time examining books and trying to determine what books were suitable (Flexner and Hopkins 1941).

Although by 1929 a list of books arranged by difficulty did exist, it listed books as either simple or difficult (Gray 1937, 239). Even a 1935 list that was "not only concerned with books but with the relationships between readers and books" classified a portion of the list "into two groups in respect to difficulty--one section recommended for those of limited ability, the other for those of average ability" (Gray 1937, 241). Even though there were over twelve million adults unable to read past the eighth grade, they could not all be placed at the same reading level (Gray 1937, 241). All fourth grade students cannot read at

the same level even though they are in the same grade, and all adults cannot read at the same level just because they are adults. But there was no way to statistically predict what those levels were.

More research needed to be done. A way needed to be discovered that could predict the reading level of the books currently available to the adult population. Also, a set of guidelines needed to be established so that books could be written at a suitable interest and grade level for those adults who were not good readers and who wanted more information about the world they lived in. Was it possible for one device to do both things, or was one device needed to predict readability and another needed to produce readable material?

Science was brought into readability in the form of readability formulas.

CHAPTER TWO

Readability in the Early 1900s

In an attempt to predict the readability levels of books and other documents, researchers devised readability formulas: mathematical formulas designed to predict if a document would be understood by a given audience. Although nineteen formulas or ways to determine readability had been devised by 1938, most of them were ways of predicting readability for children and were difficult to use because of the elements they tested. Many required the user to constantly refer to a word list of some type that could contain as many as 1,500 words.

However, by the late 1930s, government, educators, and librarians needed a means of determining the difficulty of documents written for the general adult public. Rudolf Flesch's work on developing such a formula became not only widely used, but widely publicized. Flesch felt that the general public as well as educators had the right to use his formula and wrote over ten books for the layman detailing his formulas and his beliefs on writing. Flesch was the only researcher in readability to work so hard at making sure the public knew what he had done.

Although current attacks on readability formulas deal primarily with Flesch's since his are so well known, we also need to study the early formulas since Flesch's work was based on them. We also need to look at word lists since they influenced many of the early formulas.

Early word lists

The use of word lists is probably the first attempt to classify the difficulty of written material in a scientific manner. As far back as

900 A.D., a group of religious teachers called the Talmudists counted words in an attempt to determine difficulty.

the Talmudists counted the words and individual ideas so that they could know how many times each word appeared in the scroll, and how frequently each word appeared in an unusual sense. Among the reasons for the elaborate counting of the Torah were clarification of unusual meaning and the division of the reading of the weekly portions into approximately equivalent comprehension units. (emphasis Lorge's; 1944b, 544)

The Talmudists were responsible for teaching the people the Jewish civil and religious laws that were contained in the Talmud. Since the Jews felt that being able to follow the laws was an indication of how strong their belief was, comprehension of the law was vitally important. The word lists were used to determine difficulty of the law and provided the Talmudists with an indication of which sections of the law needed further explanation (Docter 1961; Laner 1976).

Although there was some interest in word lists in the intervening years, the next major use of a word list did not occur until 1898 when F. W. Kaeding used a word list to establish a basic vocabulary in German. Kaeding felt that every one should know a certain number of words in order to communicate effectively. The count was based on almost eleven million words at a time when computers had not even been thought of (Lorge 1944b, 545). Unfortunately, Lorge does not document his source for this information.

It was not until 1921 that an extensive count of English words was made. Edward L. Thorndike's The Teacher's Word Book was a list of the 10,000 most important words based on how often they occurred in literature of various kinds for children. The list was intended to help teachers decide which words needed to be mastered and which words should be ignored until a higher grade. Vocabulary lists could be devised based on which words students had difficulty with and where the words were located on the list (Thorndike 1932, vi). By stating that certain words should be studied in certain grades, Thorndike became the first person to place a grade level on materials.

Thorndike and word lists

Thorndike's word list is important to this study since it is the basis for many of the early formulas. It classified words according to how often they were found in forty-one different sources of literature for children including classics, textbooks, newspapers, magazines, correspondence, and other documents. Thorndike published the first list in The Teacher's Word Book in 1921. In 1932 he expanded his list to 20,000 words and in 1944 to 30,000 because of additional word counts that he and others had done.

Although I had intended to include a detailed description of Thorndike's work so that I could better understand his contribution to readability, Thorndike's description of his work is rather lengthy and complicated. For example, in the Teacher's Word Book of 20,000 Words, he needs fourteen pages to explain the methods he used to count how often the words occurred. The following is a sample of his explanation:

The credit number in sources 43 to 49 inclusive was 1 for 1 or 2 occurrences. Words occurring 3 or more times had already been credited in connection with sources 23-29. In source 62, only words outside the first 7,000 of the Thorndike list of 10,000 were used, and the credit for each of the five lists was 1/2 for 1 to 4 occurrences, 1 for 5 to 9 occurrences, 1 1/2 for 10 to 29 occurrences, and 2 for 30 or more occurrences. (1932, 170)

A simpler explanation was provided by Lorge.

In addition to utilizing the sheer frequency of occurrence to estimate the importance of words, Dr. Thorndike introduced the additional consideration of range, i.e., an independent value of the number of different sources in which the word occurred. Basically the notion of range implies that, if two words have the same total frequency, the more important word is the one that occurs in the largest number of different sources. (1944b, 546)

Thorndike based his work on the theory that a word which occurs frequently and in many sources is more likely to be understood than one which is not so widely used. According to the list, words such as "about," "above," and "across" not only occur more frequently, but also occur in more sources than words such as "abduct," "accelerator," "acquisitive," and "acrobat" (1932, iii-iv). Therefore, a child should learn the words "about," "above," and "across" before they learn the other words.

This list and the more extensive ones Thorndike published in later years were concerned with how well children could understand what they read. The lists were intended to help teachers with vocabulary words for children. As such they were also perfect as the basis for several readability formulas for material for children.

Word lists and readability formulas

Lively and Pressey Possibly the first work on a readability formula was started in 1923 by Bertha A. Lively and S. L. Pressey. They assigned index numbers to the words in textbooks based on where the words occurred in the Thorndike 10,000-word frequency list. Therefore, "a word in the most frequent 1000 was given a value of 10, one in the second most frequent 1000 a value of 9, etc., down to a value of 1 for those in the least frequent 1000" (Klare 1963, 38). Then they counted the number of "zero-value words," words that were not found on Thorndike's most common one thousand words. Finally they calculated a "weighted median index number" based on "the median of the index numbers of the words with zero-value words counted twice. Thus, the higher the median index number, the easier the vocabulary" (Klare 1963, 38).

Unfortunately, anyone attempting to use the formula would need as long as three hours to determine the readability of one book (Klare 1963, 37). Yet this formula was not the only one to take a long time to use. Since most of the early formulas relied on word lists, they were difficult to apply and took a great deal of time to use. One reason Flesch's formulas became so popular is because they were easy to apply and required little time to use.

Others using word lists W. W. Patty and W. I. Painter in 1931 listed "all words located on [the] third complete line of each fifth page," determined the index number from Thorndike's word list, counted the number of different words for each sample, and then calculated the index number based on a complicated formula that included the "average-word-weighted-value," the total words in the sample, and the range of the words. However, they "made no attempt to check their formula against a specified outside criterion, letting its validity rest indirectly upon that of Thorndike's word count" (Klare 1963, 43-44).

Since the validity of Thorndike's word count had not been proven either, the validity of the work of Patty and Painter could not be certain. Other researchers had used comprehension tests or achievement tests to verify their formulas. Since readability formulas were supposed to be used to predict comprehension or difficulty, they needed a more exact, outside criterion to prove their validity.

In 1928 Mabel Vogel and Carleton Washburne added the number of simple sentences to the number of different words per one thousand words, the total number of prepositions, and the total number of words not on the Thorndike list (Klare 1963, 39). Others used combinations of the number of words on word lists, the number of words not on word lists, the number of polysyllables, the number of words in the sentence, and the number of prepositional phrases (Flesch 1943b, 4-8).

No matter what other variables were added, formulas that used word lists had some definite problems when applied to adults.

Problems with word lists Although the word lists seemed to be reliable for readability formulas for children, the same word lists were not as reliable for adults (Flesch 1943b, 15; Lorge 1944b, 549). Adults quickly outgrew the lists since they were based on prose written for children. Thorndike's lists were intended for the use of grade school teachers (Thorndike 1932, introduction) and a list compiled by Dr. Edgar Dale was based on data from children in fourth, sixth, and eighth grades (Lorge 1944b, 548). Because they had an expanded knowledge of the world, because they read more, and because they had more experiences, adults simply knew too many words to make a word list practical (Flesch 1943b, 15).

Lorge admits that the length of word lists could get out of hand and that another problem existed.

Practically all counts that have been made show that there is no finality in word counts. The extent of the sampling, the choice of the materials counted (printed books or magazines, spoken vocabulary, written correspondence, compositions, or school work), the nature of the selection of materials (geographic, urban-rural) all play a part in the specification of the universe of background materials in communication.

(1944b, 549)

Just trying to count all words in all circumstances would be impossible. And even if it were possible to count all the occurrences of all words, since people in different areas of the country use words differently and read different materials, one word list would not work for everyone.

Flesch adds another argument against word lists.

Even if we had a perfect frequency list, covering all possible occurrences and meaning in speech and print--even if we tested every piece of reading matter word for word--what would this method give us? It would give us as an index of difficulty the number of words probably unfamiliar to the reader rather than those which, though familiar to him, are essentially abstract, ambiguous or vague, or used with unfamiliar meanings, contexts, or overtones. (1943b, 14-15)

In other words, even if a perfect word list existed, it still would not tell us which words were difficult to understand because of how they were used or because they were abstract to begin with.

Klare lists some additional problems with using word lists. He states that researchers including Paul McKee and E. W. Dolch felt that word lists may not be accurate because it is possible for them to measure if the word is recognized visually rather than conceptually. In addition, word lists do not account for the different meanings some words have (1963, 87).

If word lists could not be used in adult readability formulas, then what could be used?

Gray and Leary

Original research In 1935 W. S. Gray and Bernice Leary became the first researchers to use an adult reading comprehension test to help develop their formula. Yet they are of even more importance because of the extensive testing they did of possible variables that could affect

comprehension. The following items are examples of some of the eighty-two factors they tested as potential indicators: number of easy words, number of different words, first-person pronouns, verbs, interjections, non-image-bearing words, words beginning with "e," idiomatic expressions, clauses introduced by relative pronouns, scenic narration, and psychic associations (Gray and Leary 1935, 98-99).

Gray and Leary felt that some of the items such as non-image-bearing words and psychic associations seemed "to defy objective measurement" (1935, 113) and the list was narrowed to sixty-four elements. Another twenty items (including dialect words, local expressions and coined words, idiomatic expressions, and proper nouns of mythology and history) were dropped from the list because they did not occur often enough in the reading test. Since a formula that contained forty-four elements would take too long to use, Gray and Leary narrowed the list even more by using the comprehension tests to determine which factors had the highest correlation to difficulty (Gray and Leary 1935, 98, 115-6).

Eight elements seem to meet the requirements set up for selection. They are: number of different hard words; number of easy words; percentage of monosyllables; number of first-, second-, and third-person pronouns; average sentence-length in words; percentage of different words; number of prepositional phrases; and number of simple sentences. (1935, 130)

However, having to analyze a document using eight items still required a great deal of time. Therefore, Gray and Leary worked on devising a formula that could still accurately predict difficulty and yet

used less than eight elements (1935, 137). They determined the correlations using all possible combinations of the elements and decided to drop the number of easy words, percentage of monosyllables, and number of simple sentences because they apparently did "not make for greater predictive accuracy" (1935, 138).

The five elements in the final formula were the number of hard words (the number of words not included on a list of 769 easy words compiled by Dale); the number of first-, second-, and third-person pronouns; the average number of words in a sentence; the percentage of different words; and the number of prepositional phrases.

Problems with the formula A major problem with this formula is that since no adult reading comprehension tests were currently available, Gray and Leary devised their own. And the tests were limited. The study Gray and Leary conducted was concerned only with "structural elements in reading material related to difficulty when reading is done for the purpose of obtaining a general impression of what is read" (Gray and Leary 1935, 9). Rather than dealing with a variety of mental activities involved in comprehension such as drawing inferences or appreciating stylistic values, Gray and Leary dealt with "obtaining a general impression."

Another problem was that although the range of difficulty was from grade 2 to college, the formula had originally been designed to work for adults of limited reading ability (Klare 1963, 48, 76). Yet adults and children do not read in the same way; one formula should not be able to work for both groups. Also, when compared to other formulas, Klare

states that "Gray-Leary grade ratings were consistently found to be several grades lower than those from other formulas, in some cases even as much as eight grades lower" (1963, 116) possibly because they used different criterion to establish their formula.

Lorge

In 1939 Irving Lorge tested the Gray-Leary formula against the McCall-Crabbs Standard Test Lessons in Reading. This was the first time a researcher in readability had tested the elements in his formula against any kind of standardized test that had not been developed by the researcher. Klare states that "Though not used in early research, this set of graded reading passages later became the most used and most adequate of available criteria for the construction of readability formulas" (1963, 32).

Flesch describes the test lessons as a "series of 376 passages for children which had been previously graded on the basis of ten comprehension test questions appended to each passage" (1943b, 6). The tests were supposed to teach children how to comprehend many different kinds of reading materials, how to enjoy reading, and how to be motivated and to improve expressing themselves orally. They were called "standard" test lessons because every test would show "how well the normal or typical pupil would read these same lessons" (McCall and Crabbs 1925, 184).

Because of his findings, Lorge developed a new formula which only used the number of different hard words (words not on the Dale list of 769 easy words), the number of prepositional phrases, and the average

number of words in a sentence. In his original formula, the grade-placement value referred to the average reading ability a student needed in order to answer three-fourths of the questions on the McCall-Crabbs tests correctly. Yet because Lorge only used the McCall-Crabbs test for children, his formula is geared only to children.

Yet individuals were not the only people interested in readability. The American Association for Adult Education was one of the leaders in readability research.

Work started by the Readability Laboratory

In an effort to help the large numbers of adults who were unable to read and to provide the needed research in the area of writing readable books, the American Association for Adult Education formed the Readability Laboratory in 1936. Rather than devising a formula, its job was to bring together everything that had been done on readability and then produce a series of readable books for adults (Flesch 1943b, 2).

In order to determine a way to produce readable material, Rudolf Flesch and the Laboratory's other researchers evaluated the existing formulas. The Laboratory agreed that there was a definite need for books geared to adults learning on their own. However, based on the findings of the researchers, it was unable to endorse any of the current statistical formulas as a means of measuring how readable an adult text was (Flesch 1943b, 2-7).

So, if the current formulas, such as Lorge's, could not be used because they were geared to children or based on word lists, then what

advice could the Readability Laboratory provide for people who wanted to write materials for adult education?

Advice of the Readability Laboratory

The director of the Readability Laboratory provides us with some necessary background information.

We know enough about reading difficulties to understand that readers differ a great deal in their capacity to absorb differing quantities of ideas in each thousand words of written discourse. . . . But when all the scientific tests have been studied and enlarged to the full measure of their usefulness, one must still decide what he means by 'clarity.' In the Readability Laboratory, it has been decided that a sketchy notion of the readability for the average person of a piece of prose may be discovered by examining it for three qualities which may be more or less arbitrarily named 'lucidity,' 'comprehensibility,' and 'appeal.' (Bryson 1937, 401)

But we still do not know what exactly the Readability Laboratory was suggesting. The three terms used by Bryson can mean different things to different people. Just knowing they contribute to readability does not tell us how to predict or achieve that readability. Luckily Bryson provides a more complete explanation.

By lucidity in this connection one means the internal logical construction of the writing, the kind of logical clarity which is the product of logical thought. . . . Unless this fundamental lucidity is present, however, it is very difficult

if not impossible for any reader to grasp clearly what the writer is talking about.

Lucid writing may or may not be what we can call 'comprehensible.' To any particular reader . . . a written passage is comprehensible only if he can follow the lucid steps of the writer's thought. . . .

And finally there is the quality of appeal. It might seem at first sight that a person would understand something even if he had no interest in reading it. There is, however, a positive correlation between a person's desire to read something and his capacity to understand it. . . . Books must appeal to readers if they are to be read. (1937, 401)

Flesch's summary of the Laboratory's findings is much easier to understand. He states that the terms the Laboratory used indicated that "a popular writer's three main duties are to think clearly, to write clearly, and to be interesting" (1943b, 3). Clearly the type of writing Bryson and Flesch are talking about at this time cannot be classified as highly technical or complex. They were both interested in providing information to the average adult reader.

Yet Flesch was not satisfied. He still felt it was possible for some type of statistical formula to predict readability; if one did not exist, he would have to devise one himself. This is where the current criticisms come in. Flesch felt that he succeeded; critics feel that he did not.

CHAPTER THREE

Rudolf Flesch

Rudolf Flesch's interest in readability

Interest in how well a given audience can understand a given document has been around since approximately 900 A.D. when the Talmudists worked on how to make the Torah more understandable. However, it was almost one thousand years later before work began in the United States on determining the difficulty of different documents for a given audience.

Thorndike developed the first English word lists to help grade school teachers know which words to include in vocabulary training for which grades. Also, the first readability formulas, mathematical formulas used to predict the comprehension level of a given document for a given audience, were devised to help educators know which documents were of suitable difficulty for which children.

But by the 1930s readability became of even more importance to people interested in adult education. The New Deal pushed for better education for adults, and adults finally had the time to devote to education because of the shorter work day and week or unemployment. Yet in the 1930s the majority of adults in the United States were unable to read and comprehend information that was written above the eighth grade level. Unfortunately, most of the documents aimed at adults were too difficult for them to understand.

Educators, librarians, the government, and others interested in adult education needed a way to determine which documents would be of the appropriate difficulty for specific groups of adults. They also wanted a

way to produce documents that those adults could understand and use. The Readability Laboratory was founded in 1936 to coordinate work on readability for adults. While working for the Laboratory, Rudolf Flesch evaluated the readability formulas that were currently available.

Of the nineteen formulas, fourteen relied on some type of word list. Although word lists worked for children since they had limited vocabularies, the same word lists did not work for adults. Adults simply knew too many words to make a word list practical. Also, it required a great deal of time for people to use the formulas since they had to keep referring to the word list. All of the remaining formulas relied on criteria established for children and again would not work for adults. (See Chapter Two for a more complete discussion of the available formulas and their shortcomings.)

The Readability Laboratory felt that it could not endorse any of the current formulas, but it did come up with some basic rules for people writing for the average adult reader: be clear, concise, and interesting. In spite of the problems with formulas, Rudolf Flesch felt that more work needed to be done to help the adults who wanted to learn.

Perhaps it was because he had practiced law for five years in his home country of Austria, or perhaps it was because he was forced to leave that home when Hitler started his "Anschluss." Perhaps his interest in democracy is why he worked so hard at devising a formula specifically for predicting the difficulty of materials for adults. All his work seems to indicate that that average adult with an eighth grade reading level is his primary concern.

For whatever reason, Flesch felt that all people must be able to understand what was happening in their country. One of the best ways to do that was to be able to read, and since the average reader could only at less than an eighth grade level, written materials should be geared at that eighth grade level.

Keeping Flesch's concern in mind makes it easier to understand why Flesch devised his formulas the way he did and how he felt the formulas should be used. Flesch first documented his work in his dissertation, Marks of Readable Style, and later made his work public knowledge in such books as The Art of Readable Writing. He revised the formula into two formulas and publicized them in "A New Readability Yardstick" and The Art of Plain Talk and The Art of Clear Thinking.

The basis of Flesch's first formula

Before devising his own formula, Flesch wanted to do some additional work with Lorge's formula. Lorge had used one hundred word samples and counted the number of different hard words (words not in Dale's list of 769 easy words), the average number of words in sentences, and the number of prepositional phrases.

Flesch wanted to prove that word lists could not be used in formulas for adults because adults simply knew too many words. A word list for adults would need to be so extensive that it would become uncontrollably long.

Also, Flesch felt an attempt to determine the complexity of a sentence was important and that the number of words per sentence seemed

to be a good way to determine this. Gray and Leary and Lorge had used this element.

Sentence length In what seems to be a major break from other researchers in readability, Flesch counted as sentences each grammatically independent unit of thought, not just the groups of words set off by terminal punctuation. In The Art of Plain Talk Flesch states that he is following Fowler's Dictionary of Modern English Usage. Fowler states "a sentence means a set of words complete in itself" (quoted in Flesch 1946, 32).

Therefore, if a writer used a semicolon to connect two independent clauses, Flesch would count it as two sentences, not one. In How to Be Brief (1962), Flesch clarifies his position.

Don't think of a sentence as a string of words between two periods. That's wrong; a sentence is a unit of speech, not of writing. It ends when your voice in speaking would mark a break. This break may be shown in writing by a period, a colon, a semicolon, a question mark, an exclamation point, a dash, or three dots plus a period if the sentence trails off.
(1962, 90)

Other researchers never defined what they used as a sentence. Lorge simply states that when using his formula the tester should "count the number of complete sentences" (1944a, 410). Gray and Leary only state that they used the average number of words in a sentence.

The second edition of Fowler's Modern English Usage (reprinted 1934) states that for the word "sentence,"

it would not be easy to find two [grammar books or dictionaries] that gave the same definition. . . . Here are some examples . . .

1. A word or set of words followed by a pause and revealing an intelligible purpose.

2. A group of words which makes sense.

3. A combination of words which is complete as expressing a thought. . . .

5. A meaning ful group of words that is grammatically independent. . . .

9. A combination of words that contains at least one subject and one predicate. . . . (1984, 546)

Fowler goes on to state that because there are a wide variety of definitions for the word "sentence" it is difficult to assume that any one definition is always correct.

Grammarians are free to maintain that no sequence of words can be called a s. unless it has a grammatical structure, but they should recognize that, except as a term of their art, the word has broken the bounds they have set for it. (1984, 546)

Even though grammarians would like to think that sentences are easy to define by means of a subject and a predicate, by doing so they ignore what authors are doing with sentences even today. Fragments are constantly used, especially in fiction. According to Flesch and Fowler, fragments would be considered sentences.

Flesch's definition is of major importance because it is one of the two most ignored parts of Flesch's work. (The other one, the Human Interest Score, will be discussed later.) Even Klare, in his comprehensive study The Measurement of Readability, fails to mention that Flesch uses a different meaning of "sentence." Not only does it change how sentences are counted, but allows Flesch to state that sentence fragments are correct to use because they are units of thought. By ignoring Flesch's definition, people who use the formula will not get accurate results.

Addition of abstract words The only type of word list that Flesch thought was appropriate for a formula for adults was one of abstract words. Flesch felt that theoretically the more abstract a word or idea, the more difficult it would be to comprehend. Gray and Leary had included abstract words in their original eighty-two factors affecting comprehension because of their observations

relative to the differences between the language of very simple and very cultured people. The language of the former is characterized by a simple concrete vocabulary acquired naturally in direct contact with experience. The language of cultured people, on the other hand, contains words that represent generalizations and abstractions. (1935, 105-106)

Even though Gray and Leary knew that people spoke differently, they decided not to use abstract words in their formula. The problem lay in determining which words were abstract; Gray and Leary found that the more

often a word is used, the less abstract it becomes and the harder it becomes to objectively define it as abstract (1935, 106).

Flesch still wanted to include a list of abstract words so, as a starting point, he decided to count as abstract words the words that were on a list of 13,918 words he compiled from the Thorndike Century Senior Dictionary. This dictionary was specifically written with definitions suitable for high school students. Since Flesch's average reader was at slightly less than high school level, the use of this dictionary would make more sense than one geared at college level readers. Flesch explains his methodology in Marks of Readable Style.

An abstract word as such does not exist, unless we define the term arbitrarily as a word which is most frequently used for the sake of its connotations (the properties implied by it) rather than its denotation (the thing it applies to). . . . To assemble a list of 'abstract words' in this sense the writer used the dictionary---not as a list of authentic definitions, but simply as a list of certain word meanings most frequently used. (1943b, 27)

One of the words Flesch picked as abstract is the word "medievalist." Webster's Ninth New Collegiate Dictionary (1983) contains what I consider to be a fairly clear definition, "a connoisseur or devotee of medieval arts and culture" (738). However, people who are not interested in the medieval period and who do not understand why anyone would be interested in it would consider the word "medievalist" to have some very negative, abstract aspects (connotations) connected to it.

To keep the list as simple as possible, Flesch decided to disregard "all proper names and capitalized words in general" because they represented specific, concrete people, places, or objects and, as such, theoretically could not be abstract (1943b, 27). Technical, legal, musical, and other such terms would be used only in limited instances where a specialized audience would probably have more knowledge of them. Thus, they too could be deleted from a list aimed at the average adult reader.

The first three thousand words on Thorndike's list could also be deleted from Flesch's list of abstract words. The list was comprised of the most frequently used words, and the average adult would have heard or read the words many times. Since Gray and Leary had already found that the more often a word is used the less abstract it becomes, then theoretically, the words on Thorndike's list would not abstract to the average adult because the words were so familiar. Since they were not abstract due to familiarity, if they were included in Flesch's list, then the list would not be an accurate indicator of what adults considered to be abstract. But Flesch felt that there should be another way of determining if a word was abstract or not.

Addition of affixes Flesch knew that when affixes are added to words, such as adding "-able" and "-ity" to "read" to create "readability," the words become more abstract. It seemed reasonable, then, to assume that the more affixes in the text, the more abstract the concepts discussed. Also, since constantly needing to refer to a word

list would make it difficult for people to use his formula, Flesch decided to test affixes as an indication of abstractness.

He did not count the most frequent, and therefore most well-known, morphemes since, simply because of their familiarity, they would not be an indication of difficulty. Thus, the plural "-s," "-en," and "-es," the third person singular "-s," and the possessive "-s" were not counted.

All other inflectional endings, prefixes, suffixes, and foreign endings, such as using "-ae" to form plurals, were counted. In Appendix A of his dissertation, Flesch listed prefixes, suffixes and foreign endings that should be counted along with examples of each. A partial listing of prefixes includes the "ab-" as used in "abhor," "af-" in "afford," "anti-" in "antitoxin," "suc-" in "succeed," and "tele-" in "telephone." Suffixes include "-cide" in "homicide," "-ery" in "pottery," "-ern" in "northern," "-ist" in "egoist," "-less" in "endless," and "-wise" in "likewise." If a word contained any of suffixes, then theoretically it would be abstract because the reader would need to work harder at coming up with a definition since they would need to know the definition not only of the word but also the affix.

Now Flesch had five elements he wanted to test. He would take one hundred word samples and use Lorge's three elements: the number of different hard words, the average number of words in sentences, and the number of prepositional phrases. He would also include two elements that he thought would test how abstract the hundred word sample was: the number of abstract words and the number of affixed morphemes. Flesch hoped that the results of testing these elements would prove his theory

that a list of hard words would not work for adults and that the average number of words in sentences and the number of affixed morphemes would be a good indication of difficulty.

Testing the formula

Alter Flesch decided on which elements to test, he ran into the same problem everyone else interested in adult readability formulas had run into. No standardized criteria was available that was geared specifically at adults. One possible solution was to use magazines.

Several major studies of the time attempted to rank the reading difficulty of the current popular magazines. For example, Cyrilla Walther tested magazines in an attempt to discover which magazines were best suited for high school students. Although magazines in the high school were she taught were "usually considered suitable for junior and senior high school pupils, there was a persistent tendency for the young people to do most of their leisure reading in magazines like True Story Magazine, the comics, Western Story Magazine, Liberty, Saturday Evening Post, Woman's Home companion, and Ladies' Home Journal" (1943, 101).

Even though there were other magazines for the students to read, most of them read the magazines that contained more emotional and interest appeal.

Walther wanted to know if there were any other reasons for the students to read only certain magazines. She tested three issues of twelve different magazines using the Winnetka formula (the number of different words, the number of different uncommon words, and the number of simple sentences). The Readability Laboratory and Flesch had decided

not to use the Winnetka formula because it was so specifically geared to children. However, it did have a correlation of .845, and Flesch stated that it had "been statistacally proved to be good indicies [along with Lorge's formula] of comprehension difficulty between the third and seventh reading grade levels" (1943b, 7-8). Since the readers in Walther's school were children, a formula geared to reading material for children would be appropriate for her study.

She found that True Story and Liberty were the easiest to read and offered little stimulation to the students because of the easy words and sentence structure. Time and Newsweek were the most difficult primarily because of vocabulary (Walther 1943, 104). Other researchers, including Gray, Wert, and Crawford and Sherrod, agreed with Walther's findings (studies mentioned by Walther).

Even though Walther's and others studies on magazines were done with high schoolers in mind, many adults read the same magazines. Also, since the average adult reader could only read at the eighth grade level, the average adult would more likely to read what junior high school students read.

Even if all the researchers could not agree on grade levels for the magazines, they were at least close on ranking them from easiest to most difficult. Based on those rankings, Flesch picked twenty-one magazines ranging from Romantic Story to Reader's Digest to The Yale Review to test the elements in his formula. Flesch divided the magazines into five levels of difficulty.

Level A was the easiest level and contained such magazines as Romantic Story and True Confessions; level B contained McCall's and Redbook; level C was five different issues of Reader's Digest; level D contained Fortune and The New Yorker; and level E contained The American Scholar and The Yale Review. It is important to remember that these magazines may not be written in the same style as they were in 1943.

By counting the number of times each element occurred in each of the magazines, Flesch determined correlations between the various elements and the difficulty of the magazines.

Test results The tests confirmed Flesch's beliefs that the number of hard words and the number of prepositional phrases were not good indications of difficulty. The difference in number of hard words per hundred words in the easiest to the most difficult magazines was only eight words, and Flesch did not consider this to be great enough to allow for differentiation between the reading levels. The number of prepositional phrases per hundred words did not increase over the different difficulty levels either. Also, the prediction value of the number of prepositional phrases was the lowest of all the elements tested.

Test results and the remaining three elements Sentence length, number of abstract words, and the number of affixes were found to have a high prediction value. The number of abstract words and the number of affixes were closely correlated to each other and Flesch states that "Both were shown to be better indices of difficulty for adult reading matter than the combined Lorge Readability Index" (1943b, 30). Also, as

the reading material became more difficult, the correlation between those two elements and the Lorge formula became even less. Thus, the two elements seemed to be tied to the difficulty of the material but Lorge's formula did not.

Flesch felt his original theories were proven correct by the tests he had done. Word lists other than his one for abstract words were not good predictors of readability while sentence length and affixed morphemes were.

When reading matter for adults was tested, frequency of uncommon words proved to decrease in its readability prediction value with mounting difficulty of the text; whereas sentence length, number of abstract words, and number of affixed morphemes showed their value as indices of readability even for highly difficulty material. (1943b, 31)

Since the number of uncommon words did not add to the ability of the formula to predict difficulty, Flesch decided to drop it from his formula. Also, since the number of abstract words and the number of affixes were so closely correlated, Flesch dropped the list of abstract words. This would make the application of the formula easier since now the user did not need to constantly refer to a word list.

Irving Lorge supported Flesch's decision to limit the number of elements in his formula when he wrote "Predicting Readability" a year after Flesch published his dissertation. Lorge stated,

It should be recognized, however, that such elements as the number of abstract words, the number of uncommon words, the

number of polysyllabic words, and the weighted index of difficulty of vocabulary are all intercorrelated. Any one of them could be used in place of any other, provided suitable adjustment were made in the empirical formula. . . . Structural elements of the passage provide the second most important basis for estimating the readability of text. As in measures of vocabulary, most measures of sentence structure are interrelated, so that little additional information is yielded by several measures of sentence structure. (1944a, 406)

Therefore, it should not be necessary for Flesch to include both the percentage of prepositional phrases per one hundred words and the average number of words in each sentence since they were intercorrelated.

Now that Flesch had two elements that seemed to predict the readability of magazines, he was ready to do more testing. Magazines could be used for a general guide, but Flesch felt that they were not refined enough to be used for a statistical study. Although researchers could agree on a general ranking according to difficulty, there were many variations in specific reading levels depending on which formula was used. Also, he wanted to develop a formula that would work on material geared to adults. However, Flesch still had a major problem: no reading comprehension tests for adults existed.

Additional testing

Although Flesch wanted a formula that would predict the readability of material for adults, he decided to use the 376 McCall-Crabbs Standard

Test Lessons in Reading, the same reading comprehension test that Lorge had used (see discussion in Chapter Two). Besides giving Flesch a chance to compare his findings with Lorge's, by using the Standard Test Lessons, Flesch would be using material that his average eighth-grade reader could understand. Flesch hoped that he would then be able to adapt the formula he derived for children's material to one for adults of higher reading levels. Before Flesch did any more testing, however, he decided to add another factor: appeal.

Adding appeal The work done at the Readability Laboratory had indicated that appeal, or how interested the reader was in the material, was important. Unfortunately, until this time appeal had, as an element of style, defied any statistical approach. Flesch realizes that appeal could mean different things to different people when he states "In contrast, one man's meat being another man's poison, a book catering to a special interest will be particularly unappealing to the rest of the reading public" (1943b, 33). But Flesch felt that human interest was the greatest indicator of appeal. Studies of which magazines were the most popular, such as the one by Walther that has already been discussed, supported Flesch's theory. Magazines such as Readers' Digest and True Story which presented articles covering a wide variety of subjects in the form of personal accounts or stories were two of the most popular magazines.

In addition, Bryson had stated that the Readability Laboratory had found that there is

a positive correlation between a person's desire to read something and his capacity to understand it. In reading fiction many unskilled readers will stumble through or climb over various frustrations and opaque passages because their interest in the story carries them over. (Bryson 1937, 401)

Interest in the plot and the characters enables readers to read at a higher level than they would be able to read at if they were reading technical material.

Flesch even gives an example of how changing the information into a story can make it easier to understand. He used two articles that discussed the same topic and yet came from different magazines. The articles discussed the then new "nerve-block" method of anesthesia and appeared in Life (October 27, 1947) and The New Yorker (October 25, 1947). Flesch sets the stage for the two articles by adding

The Life story served as text accompanying a series of pictures; it is straight reporting, not particularly simple, and lacks human interest (which was supplied by the pictures). The New Yorker passage is part of a personality profile, vivid, dramatic, using all the tricks of the trade to get the reader interested and keep him in suspense.

From Life:

Except in the field of surgery, control of pain is still very much in the primitive stages. Countless thousands of patients suffer the tortures of cancer, angina pectoris and

other distressing diseases while their physicians are helpless to relieve them. . . .

The nerve-block treatment is comparatively simple. . . . It merely involves the injection of an anesthetic drug along the path of the nerve carrying pain impulses from the diseased or injured tissue to the brain. . . .

From The New Yorker:

. . . Rovenstine [the doctor] then attached a syringe to the first needle, injected the procaine solution, unfastened the syringe, attached it to the next needle, injected more of the solution, and so on. The patient's face began to relax a little. . . . "You'll be alright by tonight, I think,"

Rovenstine said. He was. (1948a, 231-32)

By presenting the information in the form of a story, The New Yorker has made the information more interesting for Flesch's average adult reader. The reader still learns what nerve-blocks do, but he also becomes involved in the story because he can relate to the patient who is in pain. It is harder to become involved when the article is talking about "countless thousands" and generalizations.

Because of the difference in the stories in Life and The New Yorker, Flesch felt that

there is, fortunately, one topic everybody is interested in--people. As everyone knows, readers enjoy fiction more than non-fiction. There is a general preference for 'stories,' not

only among children . . . but also among adults. It is the most commonplace generalization about reading that can be made. Shrewd popularizers know well why they write The Story of this and The Story of that. Human interest obviously is by far the most potent factor of appeal. (1943b, 33)

Also, Gray and Leary had used the number of personal pronouns in their formula. Although Lorge had found the count of personal pronouns as a low indicator of comprehension when he tested the Gray-Leary formula, Flesch felt the method could be improved. Flesch decided to change the way of determining appeal and "in order to gain a true measure of human interest, to disregard all neuter personal pronouns, and to add to the count all references to persons either by names or by words meaning people as such or their mutual relations" (1943b, 33). Neuter pronouns could not help create the story atmosphere Flesch was looking for and references to people would.

Now Flesch had a new set of elements to test against a standard, the McCall-Crabbs test lessons. By testing personal pronouns, the number of affixes, and the average sentence length, Flesch hoped to derive a formula that could predict the readability of material for the average adult.

Computing a formula Flesch was ready to compute a formula.

First he counted the number of affixes and the number of personal references per hundred words for each of the 376 McCall-Crabbs lessons. Then he determined intercorrelations between those two factors Lorge's results in measuring the average sentence length in words. He used as

his criterion the "grade score of a child who could answer one-half of the test questions correctly" (1943b, 33-34).

Since the Standard Test Lessons calibrated grade level by how many questions were answered correctly, using the grade score of a child who could correctly answer one-half of the questions (Test Lesson 87 is used as an example) gave Flesch a reading level of approximately sixth grade. Changing it to three-fourths of the questions, aimed the formula at people who could read at approximately the seventh grade level, right where most of the adult readers of the time were (McCall and Crabbs 1925, 186).

The standard regression formula Flesch computed was

$$.1338s + .0645m - .0659h + 4.2498$$

where "s" is the average sentence length in words, "m" is the number of affixes, and "h" is the number of personal references. The 4.2498 was the amount needed to give the reading grade level when three-fourths of the questions were answered correctly.

Sentence length had a correlation of .6174, affixes a correlation of .5967, and Flesch adds

the 'human interest' factor also shows a clearly significant relationship with comprehension difficulty. . . . Interest makes for better learning. 'Appeal,' for a passage or a book, is not only an adornment and a selling point, but an educational asset and a factor of better understanding. (1943b, 34)

The formula had a corresponding multiple correlation coefficient of $R = .7358$ and a standard deviation of 1.3694 reading grades. Although the

coefficient does not seem very high (1 is perfect), the Gray-Leary formula had a correlation of .6435 and Lorge's formula had a .7669 correlation (Klare 1963, 49, 53).

What creates a problem is the number of decimal places used for the formula itself and the standard deviation. If Flesch felt that the formula was just a yardstick and not an absolute, then why did he carry the numbers in his equation out to so many decimal places? Why didn't he use

$$.13s + .06m - .07h + 4.25$$

for his formula? Also, since most educators deal with grade level in years and months (seventh grade, second month), why was the deviation carried out to four decimal places? Flesch does not explain. He does not really explain how he arrived at an adult formula either. .

An adult formula Flesch's original purpose had been to come up with a readability formula for material for adults. Although the Standard Test Lessons could give Flesch a grade level, Flesch changed the formula even more. Unfortunately, this is one of the few areas of the formula that Flesch does not clearly describe. All he states is

At this crucial point, the writer must rely on extrapolation on the findings of the first experiment, and on further experience with the formula as a measure of adult reading difficulty.

After a large number of satisfactory tests, the writer has established certain 'magazine levels' corresponding to the grade placement. . . . In general, the writer found the formula useful to distinguish not only between grade levels of

reading matter for children, but also between various types of adult reading matter. . . . This indirect evidence, added to the statistical results of the two experiments, confirms the writer's hypothesis that a combined formula, based on the number of affixed morphemes, average sentence length in words, and number of personal references, may be used as a tool for estimating the readability of adult reading matter. (1943b, 35-36)

This is one of the areas of Flesch's work where I have misgivings. Since Flesch never does explain what he did to devise his formula for adults, I find it difficult to accept this in blind faith. Although I feel that Flesch was doing the best he could under the circumstances and was genuinely interested in helping the average adult reader, it is difficult to convince others of that when he does not explain himself. Flesch, at least, felt that he had a formula that would work for adults.

Flesch's original purpose

It is important to remember Flesch's original purpose for devising the readability formula when discussing applications of the formula. His purpose was to provide a method for writers of self-help books to write books geared to adults studying on their own. Since these readers would not have experts providing individual help and since the average adult reader could only read at or below the eighth grade level, the material had to be written in a specific way.

Also, Flesch wanted materials other than self-help books to be written at a level that the average reader could understand. He felt

that in order for a democracy to work, the people of the nation needed to understand what was happening in government and in the world.

In government Government could use the formula to insure that legislation and other documents could be understood by the public. Flesch felt that the "logical prerequisite for the 'consent of the governed' is mutual understanding between the government and the people. . ." (1943b, 47). He continues by giving an example of when the government needed to appeal the public to give even more to the war effort. He states that the "selling of government bonds and stamps at prices upward from a dime forced Uncle Sam to use popular language in his appeals . . ." (1943b, 47). The formula might lead to longer documents, but by writing shorter sentences and using concrete words, the material would be simplified.

In writing books for laymen Flesch stressed over and over again how important it was for the writer to remember whom he was writing for and how that reader would use the material presented. If a writer was writing for laymen, then he must remember his audience was trying to learn on his own and did not have the background to understand complicated textbooks. Flesch felt the formula should help a writer constantly remember "to be concrete, to use short sentences, and to bring in people; and specifically as a repeated check whether the writing is actually geared to the reading capacities of the prospective readers" (1943b, 43).

Flesch also wanted the writer to remember how interested the reader might be in the material that the writer produced. As Flesch states it,

Above all, there is the specific difficulty or appeal lying in the subject matter. Obviously, even the most readable style cannot make astrophysics an easy subject; on the other hand, a reader who is genuinely interested in it, will possibly overcome all stylistic hurdles. Yet, . . . it is easy to overestimate this aspect, and even astrophysics can be presented in popular style [by using simplified English] to the lay reader. (1943b, 38)

The stories about nerve-blocks earlier in the chapter are good examples of what Flesch is talking about. For the average adult reader who has an eighth grade reading level, the article from Life is too difficult (a readability score of 5.16, scale of 0 = easy and 7 = very difficult). The article from The New Yorker had a readability score of 3.20 and would be easier for the average adult to read (Flesch 1948a, 232).

Flesch never expected books for the layman to be scientific treatises. He wanted to provide background material for the reader so that the reader would understand the basics and become interested in learning more. Bryson echoes how Flesch felt

Such books would not completely satisfy the desire for knowledge. . . . No simple introduction to any subject can get a student beyond an initial interest. It is likely to increase his own unsatisfied desire for learning, but it can increase his confidence in his own power to learn. If such an introduction is well written, it will lead the student to the

difficult books he never would have tackled without this help.

(1937, 398)

The other consideration was the length and density, or how many concepts are crowded into a few words, of the written material. For the lay reader, the shorter and less dense, the easier the material would be to read.

In libraries Librarians could pick books by how readable they were instead of by what their content was. If several books were available on the same subject, then by using the readability formula as a guideline, a book that was close to the reading level of an individual could be found. Since every reader has a different background and interests, not everyone at a particular reading level would like every book written at his level. Using the formula would at least give the librarian some place to start. This would also simplify the work done by the readers' advisers (see Chapter One for a complete discussion of this position). As a reader's abilities increased or as he learned more about a subject, he could move to a higher reading level.

In teaching English The formula also indicates a different way of teaching English. Instead of having vocabulary drills, the meanings and uses of affixes should be taught so that the student could, on his own, be better prepared to understand any new words he might encounter. Also, textbooks and general reading material could be selected using the formula. The basics behind the formula could be used to teach how density affects the language used in classic English books such as those written by Aldous Huxley and others. Although Huxley and others use long

sentences (something that would make the reading more difficult), they also tend to use fewer affixes and abstract expressions (things that would make the reading easier) (Flesch 1943b, 46-47).

In helping the general public But perhaps the most far reaching application of Flesch's work on readability is how it was treated by the general public. The public, Flesch felt, had a right to his information on readability so that everyone could be understood when they wrote or spoke. He wrote The Art of Plain Talk in 1946 and other books in following years to give the general public that information.

The book was written for anyone who had to make speeches, give lectures, write books, or talk to an audience who couldn't respond. Since these people couldn't get any feedback, they needed a book on how to write so that most people would understand what they meant. Various books were available on composition, usage, and grammar, but Flesch's advice was different. It contained specific lessons, examples, and exercises to improve the readability of anybody's writing.

Besides the formula, the book contains basic information on more readable writing. Writers should use the active voice, eliminate deadwood, use punctuation to vary sentences and expression, and keep away from rhetorical techniques such as "high-sounding phrases, [and] fancy business with words" (Flesch 1946, 101).

Revisions of the formula

Within five years of writing his dissertation, Flesch realized that his original formula could be improved. The original formula had some

shorcomings. In an article he wrote for the Journal of Applied Psychology, Flesch lists some of the problems. Sentence length

is often overemphasized, sometimes to the exclusion of the others--as in the directives that have been issued to staff writers of the Associated Press and the New York Times, recommending the use of shorter sentences in 'leads.' On the other hand, the . . . number of affixes seems often difficult to apply; users of the formula found this count particularly tedious and admitted to uncertainty in spotting affixes. The third element--references to people ., . was sometimes felt to be arbitrary and the underlying principle was often misunderstood. (1948a, 222)

Already people were zeroing in on only one aspect of Flesch's formula. Since sentence length was the easiest element to figure, people who wanted to use the formula tended to use only sentence length and not the other elements. Also, too many people who were using the formula needed to constantly refer to Flesch's list of affixes. This slowed the tester down and made the work harder. Reference to people was a difficult element because again Flesch needed to include a list of the words that he thought fit his definition of personal references. Although words like "baby" and "kid" were included in the list, words such as "teacher" and "doctor" were not. The last two words definitely refer to humans, but Flesch felt that they were too general.

Even though the time required to test a 100 word sample averaged only six minutes, Flesch considered this too long to be practical for frequent use.

The new test To correct these problems, Flesch reanalyzed the test passages using slightly different elements. Even though he wanted a formula for adult material, he still used the McCall-Crabbs' Standard Test Lessons in Reading that he had used for the original formula. He did this because there still was not any standardized data for adult comprehension such as the Standard Tests were for children. Also, the average reading level for adults had not changed; the average adult reader was still at the eighth grade level.

Sentence length The determination of sentence length remained the same. However, in the original formula, Flesch had used the correlation coefficient that Lorge had used when devising his formula. Unfortunately, Lorge had not calculated the coefficient correctly and Flesch had to recalculate the coefficient for the new formula (Lorge 1948, 141). Remember, Lorge and Flesch were working without the use of calculators and computers.

Affixes The second element, that of counting affixes, was changed to counting the number of syllables per 100 words. Flesch hypothesized that this element would provide similar results to those provided by the counting the number of affixes; adding affixes does add syllables (remember the example of adding "-able" and "-ity" to "read" to create "readability"). Also, counting syllables was faster, and people

using the formula did not have to know all the possible affixes of English.

Personal words Personal words were changed to include "all nouns with natural gender" such as "father," "sister," and "iceman"; "all pronouns except neuter pronouns" such as "he," "she," and "his"; "and the words 'people' (used with the plural verb) and 'folks'" (1948a, 223). This was approximately what Flesch had used before, but it clarified the definition and hopefully would not have a significant change in correlation. Common gender words such as "teacher" and "doctor" were still not included in the list, but at least the person using the formula had a clearer idea of what words to include.

Adding personal sentences Flesch also added the number of personal sentences which he defined as

spoken sentences, marked by quotation marks or otherwise;
question, commands, requests, and other sentences directly
addressed to the reader; exclamations; and grammatically
incomplete sentences whose meaning has to be inferred from the
context. (1948a, 223)

He used the new element to help test how conversational the material was and if it had any story interest (remember the articles about nerve-blocks). Again, if the information was presented in such a way to hold the reader's attention (such as giving the information in the form of a story), then possibly the reader would be more willing to read harder books that would give him more information on the topic he was interested in. Hopefully this new element would prevent errors in

readability ratings from happening such as when the formula was applied to what Flesch calls "direct, conversational writing" (1948a, 221).

The error in results had occurred when S. S. Stevens and Geraldine Stone had applied the original formula to several psychology texts. Although the ratings from the formula had for the most part agreed with those of students and teachers, the ratings for two of the tested textbooks did not. Koffka's Principles of Gestalt Psychology, which students usually considered unreadable, was found to be difficult, and yet William James' Principles of Psychology, which students usually considered readable, was found to be very difficult. Koffka's book should have been very difficult and James' easy (Flesch 1948a, 221-222). James presented his material by addressing the reader in several locations: "Ask half the common drunkards you know why it is that they fall so often prey to temptation, and they will say that most of the time they cannot tell" (quoted in Flesch 1948a, 228). Although the material itself was difficult, James presented it in such a way as to gain the reader's attention.

Results of the tests Flesch then calculated the inter-correlations by using the Standard Test Lessons that he had used for his original formula. He sums up the results of the test of the new formula by saying

multiple correlation of the four elements with the criterion showed no significant gain in prediction value over the earlier formula in spite of the significant prediction value of the

additional fourth element [average percentage of personal sentences] by itself. (1948a, 223)

If adding additional elements to the formula would not create a higher correlation, then what would?

Dividing one formula into two Because there was no gain in the ability of the formula to predict readability, Flesch divided the one formula into two. The first was a reading ease formula (readability) using the number of words per sentence in one hundred words and number of syllables in one hundred words. The second was a human interest formula using the number of personal words and the number of personal sentences in a hundred word sample.

The new formula for reading ease (R.E.) was

$$R.E. = 206.835 - .846 w1 - 1.1015 s1$$

where "w1" is the average number of syllables per 100 words and "s1" is the average sentence length. The 206.835 was needed to create the new scale Flesch was using for reporting the readability score.

The new human interest (H.I.) score could be found by using the formula

$$H.I. = 3.635 pw + .314 ps$$

where "pw" is the percentage of personal words and "ps" is the percentage of personal sentences. By using two formulas, the writer now had two ways of assessing his writing. If we go back to the articles on nerve-blocks, the new reading ease score for the Life article is 46 and the score for The New Yorker is 66. The human interest score for Life is only 7 and the score for The New Yorker is a high 53. Not only is the

article in The New Yorker easier to read because it has shorter sentences and fewer syllables but it also is more interesting to read because of the way it is written using the story format.

Flesch fully expected the formulas to be used together. His average adult reader needed motivation to learn and providing a story made the information more interesting and increased the chances that the reader would read more.

Flesch also changed the way the results of using the formulas was expressed. With the original formula, the results had been on a scale of zero to seven with zero indicating the material tested was very easy. People using the formula had found that scoring system difficult to get used to, possibly since it did not directly correlate with a grade level. The results of using the new formula could vary from 0, which would be practically unreadable, to a maximum of 100, which should be easy for any literate person.

The new readability formula proved to be as accurate (correlation coefficient of .70) as the old one (correlation coefficient of .74) and was easier to use and understand since no special knowledge of affixes was necessary. People using the formula did not need to refer to a list to decide if a word had several affixes; they only needed to sound out the number of syllables. Although the formula dealing with human interest did not have as high a correlation (.43) as the reading ease formula, Flesch felt it was important to motivate readers. Flesch reminds writers

that because of the criterion used, Formula B [human interest] predicts only the effect of the two 'human interest' elements on comprehension; in other words, the correlation coefficient shows only to what extent human interest in a given text will make the reader understand it better. The real value of this formula, however, lies in the fact that human interest will also increase the reader's attention and his motivation for continued reading.

(underlining Flesch's; 1948a, 226)

We need to remember that Flesch was concerned with the average adult who was not accustomed to reading. Rather than discouraging that adult by presenting information in a complicated form that was not interesting, Flesch wanted to reward the reader by providing the information in a form that he could understand and enjoy. Hopefully this would encourage the reader to read more difficult texts because he had conquered one book or article on the subject.

Yet, even though the formulas could be used in a wide variety of fields from government to libraries, and Flesch had done a great deal to include the elements that made reading not only easier but also interesting, Flesch knew that there were limitations.

Flesch's limitations on his formulas

Flesch felt that his formulas were primarily yardsticks and that any author needed to consider more than just a formula. In commenting about the formula in Marks of Readable Style Flesch states, "It must be clearly realized that it cannot do everything; it can not automatically uncover a specific book to suit an individual reader, and it will not by

itself produce readable English prose" (1943b, 38). It could come close, but since the formulas were generalities, they could not determine which person would like which book.

Later in the same book he adds,

Simplification, like writing of easy prose in general, is a hard job. There are no simple shortcuts. What the writer's formula suggests is a process of careful analysis and decomposition of words and sentences, and continual emphasis upon the human side of the ideas expressed. (1943b, 44)

A good example of what Flesch means by this is found in his book How to be Brief (1962).

It's handy to give readers an itemized list. . . . Don't do it this way:

Each item on your list must be:

1. self-contained.
2. one sentence only. Don't add a second sentence.
3. different from the rest.

This way is better:

Here's how to make a list:

1. Use only self-contained items.
2. Make each item different from the rest.
3. Use only one sentence per item. (1962, 60)

Flesch has broken down the original list into four sentences: one for the set up and one for each of the items in his list. He has considered the human element by making the items in his list into individual

commands and thus increased the human interest by getting the reader involved in what was done.

It was a process that Flesch continually stated contained more than just the formula. In the introduction to The Art of Plain Talk is another example of Flesch wanting the people using the formula to look at more than just the formula. Although the formula was part of the book, Flesch

almost wish [ed] it were not. Some readers, I am afraid, will expect a magic formula for good writing and will be disappointed with my simple yardstick. Others, with a passion for accuracy, will wallow in the little rules and computations but lose sight of the principles of plain English. What I hope for are readers who won't take the formula too seriously and won't expect from it more than a rough estimate. (1946, xii)

But almost of more importance is the fact that Flesch wrote the book for laymen: people who were not experts in the area of writing. Flesch admits he wrote the book for laymen in the preface to The Art of Plain Talk. "I confess that originally I had the ambition of seeing my name on the title page of a comprehensive scholarly work; but . . . what I came up with was another book for laymen . . ." (1946, xi).

Flesch's next book was another book for laymen and was written as a complement to The Art of Plain Talk. By 1949 Flesch had revised the formula into two and wanted laymen writers to have them. The original idea of the formula not standing by itself still held. Flesch even repeated the the warning he had given in the previous book. "What I hope

for are readers who won't take the formula too seriously and won't expect from it more than a rough estimate" (1949b, xii).

Flesch definitely foresaw people misusing his formulas and ideas. Yet he also felt his work could help everyone by making information more understandable. From the time he wrote his dissertation, he stated that the formula could not be used alone. Even in 1948 he felt "all of this is not to say . . . that my own formula is perfect; there is plenty of room for improvement and doubtless much fruitful research to come" (1948a, 334).

What else needs to be done

But Flesch felt that still more needed to be done. He knew his work and formulas were not the final cure. "What is needed is a refinement of the available measurement techniques and the utilization of work in related fields, particularly the psychology of personality. A broadened formula should include measurement of other language elements, particularly verbs, adjectives, and particles. Above all, the problem should be approached not as a problem in education . . . but as a problem in linguistics. The analysis techniques should be those used by modern linguistic science . . ." (1948b, 351).

Summary

Rudolf Flesch worked to devise a formula that would predict the readability of materials aimed at adults. The average adult who could only read at the eighth grade level or below was his primary concern. He studied and analyzed the formulas that were currently in use and then devised his own formula using the elements that seemed to be the best

indicators of difficulty: the average length of sentences in words, the number of affixes per one hundred words, and the number of personal references per one hundred words.

After more research and work he revised his original formula into two formulas: one for reading ease and one for human interest. The reading ease formula was based on the average length of sentences in words and the number of syllables per hundred words. The human interest formula was based on the number of personal words and the number of personal sentences per one hundred words. Flesch felt the human interest formula was important because it indicated how much motivation might be provided for the reader. Since Flesch's average reader would become easily discouraged because of his lack of ability to read, the writer needed to extra motivation by presenting the material in a way that would involve the reader in what was happening in the material.

Unfortunately Flesch did not realize how widespread and abused his formulas would become. As they had in the early 1940s, authors and others would zero in on the one aspect of the formulas that was easiest to count: average length of sentences in words. They would forget that Flesch said "average length" and would ignore the human interest score completely. The authors of business and technical communications textbooks would ignore the formulas, use only parts of them (sentence length), or denounce the formulas as oversimplifying complicated work.

Flesch's work for the average reader would be ignored when people tried to apply the reading ease formula to complicated technical works designed for experts in a given field. And critics would claim that

everything that Flesch had worked for was not any good for the materials produced for adults in the 1970s and 1980s.

CHAPTER FOUR

Readability Today

Flesch, 1949 to the present

Rudolf Flesch worked for the Readability Laboratory in the early 1940s. He and the other researchers were trying to find a readability formula that would work for material aimed at adults. One of the major problems was that the average reading level of adults was around eighth grade. Flesch discovered that finding a formula for adults was difficult because although adults were reading at the level of junior high students, the adults had more knowledge of the world around them and had different interests. The readability formulas that were then in use relied on either word lists, which did not work for adults because of their wider world view, or were calibrated for children.

Since nothing else existed, Flesch started work on a formula that was geared to adults. The three elements he finally decided to use were (1) the average sentence length in words, (2) the number of affixes per one hundred words, and (3) the number of personal references per one hundred words. Since there were no reading comprehension tests for adults, Flesch used the McCall-Crabbs Standard Test Lessons in Reading to calibrate his formula. The Test Lessons were calibrated for children so Flesch adjusted his formula so that it could predict the difficulty of material for the average adult reader. Yet, even though Flesch had accomplished his goal, he kept doing more research.

Three years later he revised his original formula, breaking it into two different formulas. The Reading Ease formula used the average

sentence length in words and the number of syllables per one hundred words to predict the difficulty of written materials aimed at adults. The Human Interest formula used the number of personal sentences and the number of personal words to predict how interesting written material would be. Flesch felt that the real value of the Human Interest formula "lies in the fact that human interest will also increase the reader's attention and his motivation for continued reading" (1948a, 226).

In spite of the research he had done, Flesch knew that his formulas were not perfect, that they were only yardsticks. Even in his dissertation (1943b) Flesch was cautioning readers not to expect too much from his original formula. "It must be clearly realized that it cannot do everything; it can not automatically uncover a specific book to suit an individual reader, and it will not by itself produce readable English prose" (1943b, 38).

In the preface to his first book to be written for the general public (The Art of Plain Talk 1946), he stated that

some readers, I am afraid, will expect a magic formula for good writing and will be disappointed with my simple yardstick. . .

. What I hope for are readers who won't take the formula too seriously and won't expect from it more than a rough estimate.

(xii)

He repeated this statement word for word in the introduction to his next book, The Art of Readable Writing (1949b). By 1951 he was even more explicit. "Testing readability is not an end in itself" (1951b, 25).

Unfortunately, it appears that the people who were interested in using Flesch's formulas did not read his warnings. A quote from How to Make Sense is all I have to go on, but it appears that Flesch stopped using the formulas because of how others were misusing them. He sets up his complaint by asking early in the book

How did we get to the point that people always expect a trick, a gadget, a formula, something that will teach them a precious secret of lifetime success in six easy lessons, fifteen minutes a day before breakfast? (1954, 2)

A few pages later he clarifies how he feels about his own formulas.

The dictionary contains several definitions of the word [formula] and my formula is not "a rule for doing something, esp. as used by those who do not know the reason on which it is based" . . . but it's the mathematical kind of formula: "a rule or principle, frequently expressed in algebraic symbols." In other words, my formula is not a gadget but an equation. If you feel that your writing or speaking is not up to par and apply my formula, it won't make you feel better like a drug but it will tell you what's wrong like a thermometer. (1954, 18)

Flesch gets to the real basis for his dissatisfaction on the next page.

People in journalism, advertising, personnel work, and all kinds of other professions took up the idea of measuring the length of sentences and words and began to pay attention to readability standards in their writing. Soon, however, mysterious forces got to work and before I knew it I was

saddled with the responsibility for the cut-and-dried, patent-medicine kind of formula--the one I thoroughly dislike and despise. Somehow or other the more subtle elements of my formula got lost in the shuffle and only a mechanical count of words and syllables remained. On top of that, people took the statistical averages I had found and turned them into fixed writing rules. One nice day I was introduced to the editor of a publishing house that used my formula. "Ah, so you are seventeen-word Flesch!" he said with a broad grin--making me feel exactly like the man who was asked whether he had stopped beating his wife. (1954, 19)

No matter what Flesch stated in his books or articles, people evidently were not interested in the subtleties of Flesch's findings in the area of readability. Additional proof that Flesch was tired of the formulas is that in five of the books that Flesch wrote after 1951 (How to Make Sense 1954, The Way to Write 1955, How to Be Brief 1962, Say What You Mean 1972, A Deskbook of American Spelling and Style 1977), he does not use the formulas at all.

This, then, is the basis of my thesis: any problems that people have with Flesch's formulas arise because people are misrepresenting Flesch by not understanding his purpose, by overly simplifying what he did, and by not noting the limitations that Flesch placed on his formulas.

In order to prove my thesis, I conducted two surveys and applied the three sections of my thesis to each survey. The first survey was of

textbooks in business, technical, and scientific communication, and the second survey was of articles on readability.

Readability in business and technical textbooks

In a world where thousands of dollars may be lost because of the wording of one letter or memorandum, it is vitally important that both the writer and reader of that document agree on its meaning. Readability, therefore, has become a major area of interest for business and technical communicators. Readability formulas, and especially Flesch's because his are more well-known, are being used and misused by the authors of business and technical communication textbooks and journals.

A survey of textbooks In an attempt to determine how widespread the use, or misuse, of Flesch's formulas has become, I conducted a survey of business, technical, and scientific communication textbooks found at Parks Memorial Library at Iowa State University and the textbooks I had received as review copies in 1986 and 1987. To determine which books to use at the library, I simply picked all the books on the shelves on a given day that were published after 1940. If one book had several editions on the shelf, I tried to pick the most current edition. I then checked the index, and if readability was not included, I tried to locate other areas of the book that would include such things as sentence length and word length.

I ended up with sixty-one textbooks that had been published from 1948 to 1987. Ten were published from 1948 to 1959, eleven were published between 1960 and 1969, seven were published between 1970 and

1979, and thirty-two were published after 1980. Of the sixty-one textbooks surveyed, only ten mention readability formulas in their indexes (Bovee and Thill 1986; Carosso 1986; Damerst 1972; Emberger and Hall 1955; Harty and Keenan 1987; Michaelson 1986; Stout and Perkins 1987; Turk and Kirkman 1982; Weisman 1972; Wirkus and Erickson 1972). Several of the texts say that formulas can be used in certain instances (including Bielawski and Parks 1987; Bovee and Thill 1986; Bowman and Branchaw 1987; Carosso 1986; Himstreet and Baty 1987; Sigband and Bell 1986), and only three come out and say formulas should not be used (Harty and Keenan 1987; Keene 1987; Sherman and Johnson 1983). Michaelson (How to Write and Publish Engineering Papers and Reports) states that short sentences do not work for engineers (1986, 18).

There do not seem to be any changes in how authors deal with readability in the different time periods or even over the entire span. At least one author in each decade endorses readability formulas (Kerekes and Winfrey 1951; Morris 1966; Wirkus and Erickson 1972; Carosso 1986). Minimal lengths for sentences and words are mentioned in many of the textbooks over the years, and half of the texts do not even mention readability formulas.

Textbook authors who do not misrepresent Flesch However, the formulas are mentioned by several authors; the author of a 1954 text told his readers that a good book to read on the subject of sentence length is Flesch's The Art of Readable Writing. He also advised writers that they should keep their average sentence length under twenty words (Mills and Walter 1954, 28). Wirkus and Erickson (Communication and the Technical

Man 1972) mention readability formulas and state that the purpose of the material determines what level of readability the writer should strive for.

Kerekes and Winfrey, the authors of a 1948 text that did not mention purpose, wrote another book in 1951; Flesch would not have found fault with the way they use his formulas in Report Preparation. The authors use both the Reading Ease Score and the Human Interest Score and make some interesting statements about readability, what it entails, and when human interest should be used.

The two elements which determine readability are style, or manner of writing, and subject matter, or content. . . . The reader is in many cases not as far advanced as the writer. In other instances the writer is not as skilled in the art of communication as he is in the science of his technical specialty. . . .

To what extent writing is easy to read and comprehend is determined by several factors inherent in the composition. . . . Variation in sentence length, average number of words per sentence, syllables per word, affixes per word, style of writing, type of writing - whether expository, descriptive, argumentative or narrative - vocabulary and sentence structure each contribute to the ease or difficulty with which a composition may be read. The term "reading ease" implies a degree of understanding which goes beyond the mere recognition of the words.

Many writers realize that reading ease is closely related to interest which can be developed by entertainment, pleasure and emotional effects. Interest is created primarily through personalized writing in which the human-interest element is the appealing motive. In technical, scientific and business writing, interest, though important, is not gained necessarily by personalization but through the professional significance of the subject. On the other hand, commercial technical magazines and business papers depend considerably on creating interest in their technical features in order to maintain circulation.

(171-2)

Kerekes and Winfrey now do understand that the elements found in the formulas are not the only things that contribute to readability. They also understand that human interest is important depending on the type of writing that is being done.

Hicks (Successful Technical Writing 1959) states that formulas should be used after the first draft is written and adds

Let's realize right now that formulas alone will not make dull writing interesting. Formulas used properly as measuring devices are valuable; no one will deny that. But if handled as guides during the time of writing, they become tools incorrectly used. They will not substitute for clear thinking (212)

In another communications book (Writing for Engineering and Science 1961) Hicks tells his readers that readability formulas should be used

after a document is written to determine reading ease and human interest. He also states "To learn how to apply these formulas, refer to Flesch's interesting and useful book" The Art of Readable Writing (18).

Bovee and Thill (Business Communication Today 1986) demonstrate how to use formulas, yet they also realize the formulas' limitations. They caution writers, "Do not use the Fog Index--or any formula--as a guide to writing. Instead, observe the principles of clear writing described in this book, and then use the Fog Index to check your work from time to time" (66).

Michaelson (How to Write and Publish Engineering Papers and Reports 1986) understands the limitations placed on readability formulas when engineers write for their peers. For this type of text,

readability depends more on the proper use of technical language and on the full development of sentences and paragraphs. . . . For this reason, short words and sentences are not necessarily a stylistic advantage for the engineer.

(4)

Yet some of the textbook authors misrepresent Flesch by not understanding his purpose, by overly simplifying what he did, and by not noting the limitations that Flesch placed on his formulas. At first I thought that I could discuss each area of my thesis separately, that I would have one section for authors who do not understand Flesch's purpose, one section for authors who simplify what Flesch said, and one for authors who do not note the limitations placed on his formulas.

But it turned out to be more complicated than that. Because authors do not understand Flesch's purpose of writing for the general public, they tend to oversimplify the formulas and the advice Flesch gave to writers and assume that everything should be written in short sentences with short words. Since they have already simplified what he did, they then ignore Flesch's limitations and apply the formulas to every document no matter who the audience is or what the purpose is for writing the document. Finally, those same authors then tend to blame the formulas because they are not perfect and cannot work in every situation. The following section, then, became one long section dealing with the interrelated aspects of my thesis.

Textbook authors who do misrepresent Flesch Since Flesch's original purpose was to devise a formula to help the average adult reader who was learning on his own, he stated that the information for that reader should be simple (remember an average reading level of less than eighth grade) and interesting so that the reader would want to read more. Writers should, in a sense, write to the formulas so that they would remember to keep the average sentence length and word length down.

Flesch actually did say to keep the average sentence length under twenty words and that "news magazines and digests run to 15-17 words" (1962, 90). But it was an average only.

The test doesn't mean that you should use short sentences only. It means that you should watch the average length of your sentences. In fact, a rhythmical succession of long and short sentences is more effective than a series of medium-sized ones.

Even so, you can always avoid jerkiness by proper punctuation. There's no law that says sentences have to end in periods; you'll often get smoother transitions by using semicolons and colons. (emphasis Flesch's; 1951b, 40)

And the words you use depend on your audience and your topic.

When you deal with a technical subject, you have to use technical terms. Explain them when you write for laymen; use them freely when you write for professionals. When your writing gets loaded down with many long, cumbersome terms, make doubly sure all the other words are as short and simple as you can make them. (1962, 102)

The type of writing made a difference, too. Although Flesch felt that his Reading Ease Score and Human Interest Score should be used by all writers, he realized that all writers were not writing the same type of material that he was. He knew that what the writer did with the formulas depends on who the writer's audience is and what the writer's purpose is.

You have to distinguish between writing for specialists and writing for laymen. Popular science is, of course, an excellent field to apply readability tests. When it comes to science written for scientists, readability is often less important than other things. In an abstract journal, for instance, the first consideration is brevity.

As to technical terms, there's no point in avoiding them as long as the readers understand them. (1951b, 46)

He also knew that the type of writing that was being done would make a difference as to how much human interest was included in the material.

In principle, you could and should get human interest into everything. Everything has a history--that is, a story with people in it--and a significance--that is, an effect upon the lives of people. The most abstruse scientific theory can be explained in terms of its discovery, and complicated legislation becomes understandable when you show how it applies to actual cases.

Of course, you wouldn't want to fictionalize and make every thing into a boy-meets-girl story. It's up to you to find the most suitable treatment. (1951b, 47-8)

But Flesch was primarily concerned with the audience and purpose. He stated that "There's no point in controlling readability if you don't know who you are writing for" (1951b, 25), and added "What are you writing for? . . . Be sure of what you are trying to do and write according" (1951b, 25). Flesch argued that the formulas were only yardsticks and should not be used alone (1943b, 38; 1951b, 25; 1946, introduction; 1949b, introduction).

Yet when people think of Flesch they have a tendency to think only in terms of short sentences and words (see the quote on pages 68-9). Because they do not understand his original purpose, they ignore his other advice and limitations and claim that he just used short sentences made of short words. They fail to realize that Flesch was writing for a general audience and that his comments about short sentences and short

words might not apply to the type of technical and scientific writing that they are teaching. They also tend to make absolutes ("it's a good idea to look twice at any sentence you write that is longer than 17 words" Keene 1987, 55), and then because they have over simplified Flesch's work by placing absolutes on sentence length and word length, they do not note the limitations that Flesch put on his formula.

And they started misrepresenting Flesch in the very first text that mentions him.

By 1948, Flesch's original formula was used in a textbook by Kerekes and Winfrey. The authors state that readability should be tested and that writers should keep sentences "short and simple" (1948, 37). In this book the authors do not deal with any of the limitations of the formula or acknowledge that sentence length should be determined by the audience and purpose and that sentences should not automatically be "short and simple."

Yet some of the authors do not refer to Flesch and readability formulas and simply state that sentence length and word length should be kept to a minimum (sixteen out of sixty-one authors including Bielawski and Parks 1987, 52; Harty and Keenen 1987, 101; Keene 1987, 55; Kolin 1986, 70; Weil 1954, 29) or that formulas are not any good because they only measure sentence length and word length (Harty and Keenen 1987, 47).

Yet, I cannot state conclusively that the idea of using short sentences and short words can be blamed on the authors of textbooks. If they did not get the information from Flesch, then they may have obtained

it from a source that has already simplified Flesch's information for them. Weil (The Technical Report, 1954) states

A Chicago newspaper has simplified Flesch's original readable-writing formula in a guide for its writers that goes something like this: "The average sentence shall not contain more than 19 words and 28 syllables." This rule combines simplicity of sentence structure with a minimum of "two-bit words" where shorter words are equally descriptive. (1954, 29)

What Weil, the other authors, and the Chicago newspaper seem to have forgotten are the limitations that go with the formulas and limited sentence length and word length.

In How to be Brief (1962) Flesch did state that the average sentence length should be under twenty words (90). Yet he also placed some limitations on that statement. He stated that writers should "use colons and semicolons freely to mark your shorter sentences. As a rule of thumb, stick to one idea to a sentence" (1962, 90). Remember, Flesch felt that sentences were "units of speech, not of writing" (1962, 90) and that sentence fragments "are usually fine sentences, common in conversational writing" (1962, 90). Flesch's average twenty word sentence was surrounded by fragments and sentences joined by colons and semicolons.

Authors who tell writers not to use fragments (Bovee and Thill 1986, 599; Damerst 1972, 303; Harty and Keenan 1987, 326; Sherman and Johnson 1983, 426; Weil 1954, 66) are eliminating one means Flesch had of making sentences shorter. Also by counting "units of speech" instead of

terminal punctuation, Flesch would end up with shorter sentences and a smaller average length than someone who only counted terminal punctuation.

Authors also misrepresent Flesch by oversimplifying Flesch's work and leaving out his second formula, which measures human interest. Of the sixty-two textbooks, only three mention the Human Interest Score (Kerekes and Winfrey 1951; Mills and Walter 1954; Sherlock 1985). Yet Flesch felt that the Human Interest Score was of utmost importance to materials geared for his average adult reader. He even states

As a matter of fact, I consider the Human Interest Score more important than the Reading Ease Score. After all, if a reader is genuinely interested in what he is reading, he may be able to work his way through long sentences and difficult words; but even if you write primer style, he may not look at your stuff at all if your presentation is as dull as dishwater. Reading ease simplifies the job of reading; but human interest provides motivation-which is more important. (1951b, 41)

The research done by the Readability Laboratory and Gray (see Chapters 2 and 3) supported Flesch's emphasis on providing interest for the average reader. "Books must appeal to readers if they are to be read" (Bryson 1937, 401). Flesch's average reader could become easily discouraged from reading if the material was not interesting.

Keene (Effective Professional Writing) is a good example of an author attacking formulas and yet not understanding the limitations placed on the formulas. He states

The weakness of all such quantitative measures of readability is that they fail to take the audience into account; a particular passage is readable only in relation to a particular audience's interaction with it. (*italics are Keene's*; 1987, 45)

Yet Flesch was aware of the audience and knew that his formulas were only yardsticks because every reader of a document would come to it with a different background and different interests. Flesch stated in his first book that "it can not automatically uncover a specific book to suit an individual reader" (*emphasis Flesch's*; 1946, 38). He adds

The word "accurate" doesn't apply to a test of this sort. All the test does is predict the "probable" readability (ease and interest of reading) for the "average" reader. Since probability is a matter of degree and since most readers are above or below average, you can see that the test will give you only a rough estimate of readability. (1951b, 37)

Another limitation that Keene and the other authors attacking formulas fail to remember is that Flesch never intended the formulas to be used by themselves (see Chapter 3 "Flesch's limitations on his formulas"). Yet those same authors would probably agree with the other considerations that Flesch included in several of his books. The following are some of Flesch's comments on things to consider besides short sentences and short words.

FOCUS ON YOUR READER

. . . Find out as much as you can about your readers' education, reading habits, age, sex, occupational background, and so on. Even a clear conception of the characteristics of 'the general reader' is better than writing in a vacuum.

FOCUS ON YOUR PURPOSE

. . . Be sure of what you are trying to do and write accordingly.

DESIGN YOUR WRITING FUNCTIONALLY

Once you know your audience and your purpose, you can design your piece of writing to fit. . . .

FIND SIMPLER WORDS

. . . shorten the average length of your words. some of the long, complex words may be technical terms that shouldn't be changed. As for the rest, remember that complexity rather than length makes for reading difficulty. . . . It is usually better to recast sentences than simply replace one word by another. . . .

LEARN TO CUT

The most common fault of writing is wordiness; the most important editorial job is cutting. Cutting unessentials will make essentials stand out better and save the reader time.

If your piece of writing is too long, some readers may skip it altogether. Often you have to design a piece of writing to attract readers by sheer brevity. (1951b, 25-27)

The following comments are taken from How to be Brief (1962).

Focus. Problems are solved by focusing on a key element of the situation; writing problems are solved the same way. Go over the material you're going to write about and focus on the key element that'll make the reader understand the whole thing. . .

. don't start writing until you've found the proper focus; once you've found it, it's easy; without it, nothing seems to make sense. (42-3)

Manuals. . . . Break the job down into small steps and list the steps. "1. Do this; 2. Do that; 3. Do that;" etc.

Think of various problems that may come up, special cases, emergencies, the unusual. Try to foresee the questions the manual will have to answer on the job. (61)

Say what you mean; don't try to cover up. What would you think of this if someone else had written it? Remember readers are just as smart as you are. (72)

Don't sacrifice readability for brevity. If you cut out a necessary explanation or illustration, you'll save space but it may take your reader more time and effort to read and understand what's left. Don't try to save space and paper; save actual reading time. Readability may call for more words, but they'll be read more quickly. (81)

Self-explanatory. "You will find the enclosed booklet self-explanatory." No, he won't. Don't shirk the job of explaining it to him; he won't work his way through the small

print and anyway, you have to tell him exactly what applies to his case and how. (89)

Space. By all means be brief, but don't try to save space--save your reader time. Be lavish with space. Use plenty of paragraphs, subheads, indentions, tabulations. . . . Make your writing stand out; be brief but effective. (94)

Whenever you give readers information on a subject they don't know much about, you're teaching. Remember that; use the tools of teaching--repeat, summarize, drive home your points, go from the familiar to the unfamiliar, give illustrations. Make sure you leave your readers with more information than they had when they started. (102)

Keep a running conversation with your reader. Use the second-person pronoun whenever you can. Translate everything into "you" language. "This applies to citizens over 65" = "if you're over 65, this applies to you." . . .

Always write directly to "you," the person you're trying to reach with your written message. Don't write in mental isolation; reach out to your reader. (114)

Yet these same areas are also stressed and covered by Keene and the authors who do not even mention formulas. It is beyond the scope of this thesis to correlate everything that the authors of the sixty-one texts discuss that can be related to Flesch's recommendations, but I can make some generalizations. Most authors would agree that the writer should know about the audience and purpose of the material being written. For

example, Michaelson spends five pages discussing the importance of determining the reader's needs and interests and "matching the manuscript with the readership" (1986, 9-13); Harty and Keenen (1987) devote an entire chapter to purpose and audience; Mills and Walter (1954) devote parts of their book to adapting to the reader and saying what you mean. Many of the more recent books discuss the "you-attitude," writing directly to the reader (Bovee and Thill 1986; Bowman and Branchaw 1987; Keene 1987).

Although some authors misrepresent Flesch by not understanding his purpose, by overly simplifying his work, and by ignoring his limitations, many of the authors do realize that the audience and purpose change how the material should be written and that the formulas have limitations. The biggest problem is when authors take Flesch's statements about short sentences and short words and consider them to be absolutes that can be applied to any situation regardless of the audience.

However, authors of textbooks are not the only people interested in formulas. Authors of journal articles also misrepresent Flesch by not understanding his purpose, by overly simplifying his work, and by ignoring his limitations.

Journal articles on readability and formulas

I conducted a survey of journal articles for two reasons: to learn more about what had been done on readability and to find out how people feel about readability formulas today. I started by checking the reference sections of journal articles I had received in several classes I had taken in business and technical communications. I tried to pick

articles that dealt specifically with Flesch's formulas, although that was not always possible. Next I looked through all the issues of several business and technical journals to find any articles that might not have been mentioned in the reference section of articles I already had copies of (including Journal of Business Communication, IEEE Transactions on Professional Communication, Technical Communication, and Journal of Technical Writing and Communication). I ended up with seventy-five articles that fall into the following five categories (See Works Cited for a breakdown of the articles).

1. Articles that give historical information and/or describe the way a formula was devised (sixteen articles, most of which were used to write Chapters 1, 2, and 3).
2. Articles that support the use of formulas (fourteen articles).
3. Articles that attack the use of formulas (eleven articles).
4. Articles that describe how a formula has been used in a specific instance. These usually support the use of formulas even though they do not explicitly say so (twenty-one articles).
5. Articles that do not fit any of the other categories (thirteen).

In some cases it was difficult to determine which category to place an article in. For instance, Drury (1985) discusses using readability formulas when the audience is composed of non-fluent users of English; this is not how Flesch intended his formulas to be used, so to a certain extent it belongs in category 5, articles that do not fit any of the other categories. On the other hand, Drury is critical of readability formulas when the audience is not fluent in English, so the article

belongs in category 3, articles that attack the use of formulas. I placed it in category 3 in an attempt to show that I was not placing articles in categories that would indicate more support for Flesch than there actually was.

I was surprised at what I found. Of seventy-five journal articles, fourteen supported formulas and eleven were against formulas. But only five of those eleven stated that formulas should never be used (Battison and Goswami 1981; Bruce, Rubin, and Starr 1981; McConnell 1983; Selzer 1981; Stevens 1980). Two of the nine stated that formulas did not work for literary prose but might be useful in other areas (Rygiel 1982; Williams 1984); one stated that formulas did not work when the audience was non-native American or disadvantaged (Drury 1985); one stated that formulas might be useful in other areas but did not work with technical writing (Plung 1981); and the last two stated that formulas should not be used as a revision technique (Lynn 1984; Redish 1981).

No matter which category the articles were put in, their authors have one thing in common: they all admit that formulas are not perfect and that they are not the only solution to the problems facing writers. They all agree that formulas are unable to measure such things as organization and format (which Flesch would agree with). Where the authors differ is in how they feel the formulas should be used and whether or not they saw the formulas as being perfect.

Authors who were willing to accept the formulas as only yardsticks of readability were more willing to use formulas. Authors who wanted formulas to do everything from predicting readability to revising text

were more likely to discredit formulas. Proponents feel that even with the inherent problems readability formulas are useful as predictors of the difficulty of a document. Critics feel that the multiple problems inherent in the formulas prevent them from being appropriate under any circumstances. However, they misrepresent Flesch by not understanding his purpose, by overly simplifying what he did, and by not noting the limitations that Flesch placed on his formulas.

Selzer attacks formulas

Jack Selzer ("Readability is a Four-Letter Word", Journal of Business Communication, 1981) is one of the most outspoken critics against Flesch's readability formulas, and his article was mentioned in several classes I took. I have decided to use him as a representative of critics of formulas for two reasons: he presents most of the arguments against formulas (I will show this in the next section) and other authors refer to his article as "an excellent overview" (Lynn 1984, 140) and "an excellent summary of the criticisms or readability indexes" (Bogert 1985, 11). Selzer has three major complaints against readability formulas: that they cannot predict readability, that they cannot produce readable prose, and that they have had a harmful influence on the teaching of business writing. Yet in each of these areas he is misrepresenting Flesch.

Formulas cannot predict readability? The first major problem that Selzer has against formulas is that they are not accurate at predicting readability. He feels that there are several reasons for this, and those reasons center around what elements the formulas contain

and what the formulas measure and do not measure. Selzer and other authors (Bruce, Rubin, and Starr 1981; McConnell 1983) state that using sentence length and word length creates problems. Selzer states that because formulas

must be based on easy-to-count factors (typically sentence length and word length), the formulas are too simple; they do not consider enough variables to give a real sense of the difficulty of prose. . . . Their inability to get at the real determiner of word difficulty--familiarity--is reflected by the fact that Lewis Carroll's famous nonsense poem 'Jabberwocky' earns an incredibly high 90+ on the Flesch scale. . . . Most seriously, the formulas do not consider elements that cause difficulty beyond the sentence level; if they cannot discriminate well between scrambled sentences, they certainly cannot detect scrambled paragraphs and letters and reports. (1981, 25)

Redish expands Selzer's arguments.

Because readability formulas only include measures on the sentence level and the word level, they do not give the writer any indication of how well organized the entire document is or whether, in fact, it will achieve its purpose with its audience. (1981, 48)

Duffy agrees that a major problem with readability formulas is that they do not address organization. Yet Redish adds to her statement that "These global concerns about documents are not easy to measure in

quantifiable units. Therefore, they are generally not included in readability research" (1981, 48).

Battison and Goswami include the following on their list of problems with readability formulas: "The formulas do not detect misused words, ungrammatical sentences, illogical propositions, or nonsense. The formulas do not measure organization, effectiveness, or relevance to the audience" (1981, 10). Yet the authors go on to add "readability formulas might have some valid uses and they might be improved upon. But since they have such a potential for mischief and misuse, we do not use them or recommend that others use them" (1981, 10). Battison and Goswami seem to feel that writers cannot be trusted with the readability formulas.

Williams supports Selzer's complaint that formulas do not contain enough elements. She cites research that provides her with a list of some of the things that could influence how well a document is understood: "the meaning of a word that has several dictionary meanings; . . . motives inferred from action or from deceptive or lying speech in narratives; . . . the author's attitude toward the audience" (1984, 142). But she also adds that the authors of that research have a model that "is merely theory; they have not yet expanded the framework to support an actual readability formula" (1984, 143).

But by stating that formulas do not contain enough elements, authors are misrepresenting Flesh by not understanding Flesch's original purpose and by not noting the limitations he placed on his formulas. Flesch was trying to devise a formula that would predict the difficulty of a given document for the average reader. Because of the research he and others

(Gray and Leary; Lorge) had done, he knew that for the average adult reader "easy-to-count factors" could indicate difficulty to a certain extent (see Chapter 3 for a complete discussion). He also wanted a formula that would be easy to use and that would take a relatively short time to apply. Gray and Leary had dropped several elements from their formula simply because it took too much time to apply a formula with more than five elements (1935, 138).

Current research by Klare and Bormuth also supports the elements that Flesch included in his formulas. Klare, who Selzer calls "a highly respected educator and psychologist" (1981, 24), agrees with Flesch in using only a few elements in a formula.

Unless a user is interested in doing research, there is little to be gained from choosing a highly complex formula. A simple 2-variable formula should be sufficient, especially if one of the variables is a word or semantic variable and the other is a sentence or syntactic variable. Beyond these 2 variables, further additions add relatively little predictive validity compared to the added application time involved, and . . . a formula with as many as 20 variables may well be an unreliable predictor even if applied by machine. (1974-75, 96)

Bormuth, one of the main researchers in readability today, also states that the number of elements in a formula does not need to be large.

Over 150 linguistic variables have been shown to correlate with difficulty. . . . Fortunately, many of these variables are

closely related to each other. Through factor analytic techniques redundancies can be removed and the entire set of variables reduced to a few basic style factors. (1966, 130)

Selzer states that since formulas only consider the elements in sentences, then they cannot measure difficulty of paragraphs. Yet, sentences are the building blocks of paragraphs. If a writer can write sentences correctly, then he is more likely to write paragraphs correctly than someone who cannot even write sentences. Tebeaux states that

if you will examine a piece of technical writing you are having trouble reading, you will probably see that the lack of clarity and readability comes from individual sentences you cannot grasp easily. Therefore, . . . to learn to produce clear, readable writing, we must begin with the sentence. (emphasis Tebeaux's; 1980, 71)

Tibbetts adds that "Style is found mainly in the English sentence, which is relatively controllable" (1981, 53).

Selzer and others state that the formulas fail to measure how familiar a word is to the reader and also fail to identify misplaced modifiers or "convoluted word order" (Selzer 1981, 25; McConnell 1983; Redish 1981). As an example he cites a test that applied Flesch's formula to documents such as Lewis Carroll's poem "Jabberwocky." Yet the formulas were never supposed to be used on nonsense and Selzer is again misrepresenting Flesch by not noting Flesch's limitations on the formulas.

Flesch stated that the "test estimates sheer readability; it won't tell you whether the ideas expressed are nonsense" (1951b, 48). Several authors state that "readability formulas assume that the text is composed of well-formed grammatical sentences" (Redish 1981, 47) and that "The formulas all assume that the writer has done most of his task correctly" (Powell 1981, 44). By applying the formulas to something that we know is nonsense, we are setting up the formulas to fail since they were never devised to determine sensibility.

Another problem Selzer sees with the formulas is that not everyone uses the term "readability" in the same way. He states that "when people in business writing use the term, they often mean . . . not just comprehensibility, but interest value (or a combination of both)" (1981, 26). Yet that is the definition that Flesch would use and that is why he had two formulas: one to test reading ease and one to test human interest. And Flesch's concern with human interest is supported by others. Battison and Goswami state that "Put quite simply, written texts are easier to understand if they construct 'scenarios' for readers, with people and things interacting concretely to create events" (1981, 11). Tibbetts states that "A lot of prose is unreadable because it is empty of life, of human beings and human-ness, as if it were written by and for computers" (1981, 55-6). It is not Flesch's fault or the formulas' fault that the human interest formula is being ignored.

Selzer's final argument against the ability of formulas to predict readability is that they "assume that adult readers with the same educational background will respond to a passage in the same way" (1981,

26; Redish 1981; Bruce, Rubin, and Starr 1981). Yet Flesch never stated that. He knew that all adults could not read at the same level just because they are adults in the same way that all fourth grade students can not read at the same level even though they are in the same grade. That is why he stressed the audience so much ("There's no point in controlling readability if you don't know who you are writing for." 1951b, 25).

The difference in audiences is one of the reasons why he called his formulas "yardsticks" and stated that "it must be clearly realized that it [the formulas] cannot do everything; it can not automatically uncover a specific book to suit an individual reader, and it will not be itself produce readable English prose" (1943b, 38).

Selzer's criticisms do seem justified only if the formulas are supposed to be perfect. Unfortunately they are not. They do, however, provide a means of predicting the difficulty of written documents that are produced for the general public. Klare states that "no argument that they cause ease or difficulty is intended; they are merely good indices of difficulty" (underlining Klare's; 1974-75, 97), and Lorge stated that "they are a useful adjunct in the objective evaluation of written and spoken materials" (1949, 94).

Formulas cannot produce readable writing? Selzer's and other authors (Allen 1985; Bruce, Rubin and Starr 1981; Dreyer 1984; Redish 1981) have another problem with readability formulas: some people including Flesch have stated that writers should remember the formulas as they write. Selzer states

When our textbooks suggest that "average sentence length . . . usually should not exceed seventeen to twenty words," or when they advise writers to "keep your sentences short, and your words shorter," . . . they do so on the authority of readability formulas. (1981, 27)

He even quotes Klare; "altering word or sentence length, of themselves, can provide no assurance of readability. How to achieve more readable writing is another and much more complicated endeavor" (quoted in Selzer; 1981, 29).

However, Selzer, and the textbook authors, are again misrepresenting Flesch by overly simplifying Flesch's work by looking just at sentence length and word length and they are misrepresenting him by ignoring the limitations that the textbook authors have ignored. Yes, Flesch did state that the average sentence should be under twenty words. But he placed limitations on his statements; remember he said "average," which means some sentences will be longer and some shorter than the average length of all the sentences.

The test doesn't mean that you should use short sentences only. . . . In fact, a rhythmical succession of long and short sentences is more effective than a series of medium-sized ones. Even so, you can always avoid jerkiness by proper punctuation. There's no law that says sentences have to end in periods; you'll often get smoother transitions by using semicolons and colons. (1951b, 40)

He also stated that "one-syllable words are fine, but it's not the number of syllables that matters but the simplicity or complexity of the words" (1962, 68) and "It so happens that in English most short words are also easier to read and understand. But that doesn't mean you shouldn't use a longer word if it conveys you meaning better" (1951b, 40).

Writing to the formulas to a certain extent can help writers to keep their audience constantly in mind. Also, using a syllable count "can force writers to consider word choice" and "Looking at average sentence length leads to consideration of the way in which sentences are formed" (Bogert 1985, 11).

Klare also supports what Flesch said. In 1977 he presented a list of suggestions for producing more readable writing. Included in his list of suggestions for word changes are "Brevity. Shorter words (versus longer) tend to make reading easier and faster . . . Examples are: 'fail' versus 'malfunction;' 'turn' versus 'rotation' . . ." (1977, 3). Suggestions for changes in sentences include the following:

1. Brevity. Shortened sentences and clauses contribute to more readable writing. However, not all long sentences are equally difficult to understand, so consider potential changes thoughtfully before making them. . . .
2. Active versus passive voice. The active form of a statement leads to easier recall and verification than the passive form. (1977, 3)

Tebeaux also suggests that writers should "use active voice as frequently as possible" (1980, 76). By suggesting that writers use the active form,

Klare and Tebeaux are giving writers another way to make sentences shorter.

By providing short, connected sentences that had short, understandable words, Flesch was attempting to make the information easy to read so that the reader would not be discouraged. However, when writers try to write only short sentences and words, they are misrepresenting Flesch by overly simplifying his work and ignoring the limitations he placed on his suggestions.

Formulas are harmful influences on the teaching of business writing?

Selzer's final major argument is that "readability formulas are largely responsible for the badly oversimplified discussions of style that rule in our textbooks and industry writing manuals" (1981, 30). How can a formula be responsible if an author is misrepresenting Flesch's work by not understanding Flesch's purpose, by overly simplifying his work, and by not noting his limitations? (See the section Textbook authors are misrepresenting Flesch in the first part of this chapter.)

Flesch stated that

Readability is certainly not all there is to good writing. But teachers of writing should be familiar with the point of view of readability research and should teach communication to an audience for a purpose rather than composition as such. They should not teach the imitation of literary models regardless of the audience and the purpose they were supposed to serve.

(1951b, 41-2)

Flesch often stated that the writer should fit his writing to his audience and purpose. The writer has choices to make as he writes and even before he writes because of who his audience is and why he is writing. If textbooks are overly concerned with the finished product, then again it is not the formulas' fault but the authors.

Perhaps the biggest misrepresentation of Flesch's work is done when authors expect the formulas to include everything, to work in every situation, and to give absolutes (find the correct book for each individual). But Flesch never intended them to be used that way. Flesch would agree that formulas do not measure everything that could determine difficulty; that is why he stated that his formulas are only yardsticks of difficulty and that they cannot do everything (1943b, 38; 1951b, 25; 1946, introduction; 1949b, introduction).

Judith Bogert ("In Defense of the Fog Index," 1985), defends all readability formulas by stating that "Readability indexes formulas were never intended to serve as the Good Housekeeping seal of approval for writing. They were designed only as predictors of reading ease" (9). She also realizes that it is the misuse of formulas that has caused many of the problems critics find with formulas.

Contrary to what one critic has claimed, readability indexes are neither "a four-letter word" nor "pernicious" [reference to Selzer]. It is the misuse, not the use, of the fog index [another] formula which is pernicious. (1985, 11)

Powell supports Flesch by stating that "Too often people accept a mathematical formula as if it were a revelation from heaven, guaranteed

to be perfect and not capable of misuse" (1981, 44). He adds, "The formulas can give the author some guidance as to whether word complexity, sentence complexity, or both are his problem" (1981, 44) but that

there is no definite correlation between readability and the quality of writing. A piece can have a readability level of 10th grade and be ignored because it is so insipid. Another piece that rates an 18 may be read and reread until comprehension comes because it has significant new ideas.

(1981, 44)

Powell's statement sounds like an echo of Flesch's.

if a reader is genuinely interested in what he is reading, he may be able to work his way through long sentences and difficult words; . . . even if you write primer style, he may not look at your stuff at all if your presentation is as dull as dishwater" (1951b, 41).

Selzer and the other critics of readability formulas need to keep in mind that Flesch's formulas and suggests cannot be simplified to fit any situation and that there are definite limitations placed on the formulas. Perhaps then they will be able to use the formulas correctly.

A formula is not a magic key to readable writing, nor is it a destroyer of writing. Those who believe it is the one have gone beyond it to make unwarranted, and the other to make unfair, implications. They are at fault, not the formula.

(Klare and Buck quoted in Bogert 1985, 11)

Bormuth and readability

Other authors have a problem with readability formulas that Selzer does not mention. Bormuth and Stevens are two authors who do not believe that the formulas are based on a reliable criterion. They feel that the McCall-Crabbs Standard Test Lessons in Reading are not scientific enough and that "they are not based on extensive testing and the grade scores they yield lack reliability and comparability" (Stevens 1980, 413). "The matter was confounded further by the fact that it is notoriously easy to vary the difficulties of these tests simply by changing the alternatives to the questions" (Bormuth 1966, 82). Since the results depended on how many questions a reader could answer correctly, simply by changing how the question was worded the number of correct responses could also be changed.

Yet at the time Flesch used them, they were the only standardized reading comprehension tests that were nationally known and used. Also, McCall and Crabbs give a different prospective to the test lessons. In an article they wrote for Teachers College Record, McCall and Crabbs state that the lessons are the results of nearly ten years of experimentation and work in the area of reading comprehension. To me that sounds like extensive testing. Also, McCall and Crabbs stated that

Not only is every test a lesson, but every test is a standard test; that is it shows how well the normal or typical pupil world read these same lessons. . . . The Score for each test lesson is in a form which shows a pupil's proper grade location in reading in a typical school. By averaging the scores for a

series of lessons a very reliable grade placement can be determined. (1925, 184)

Again, this would seem to mean that the Test Lessons could be reliable indicators of reading levels.

We run into another problem when dealing with the cloze test that Bormuth used for his formulas; it appears to be equally faulty. The cloze test replaces certain words in a sentence, say every fifth word, with a blank and then determines readability on the number of blanks that are filled in correctly. Certain words in a sentence are more readily predictable ("the book is laying ____ the table"), and as Klare states, "in general, cloze scores tend to yield higher values because they are easier to predict with the same index variables" (1976, 131).

Readability formulas are not perfect. They do not consider every aspect of difficulty because it would take too long to administer the formulas and because some elements of difficulty can not yet be measured by statistics. Critics of formulas misrepresent Flesch and the other readability researchers by failing to understand Flesch's original purpose, by overly simplifying Flesch's work, and by not noting the limitations Flesch placed on his formulas.

Some authors do recognize the limitations placed on formulas and do use them the way in which they were intended to be used. Docter ("Testing the Readability of Engineering Writing," 1961) states that the formulas are not always applicable because of the longer, technical terms that are found in engineering. Yet he also feels that Flesch is "a step

in the right direction" (1961, 91) and that writers have a responsibility to their audience.

As writers, we have the tremendous responsibility of taking someone else's thoughts, concepts, ideas, or plans, and making them coherent and understandable to a third person. Thus, as the middle link in a transmission chain, we can clarify or distort the signal. Perhaps a bit of Flesch sampling and testings of our writings may help us to maintain a clear signal. (1961, 96)

Klare also feels that writers of technical material have a responsibility.

Avoiding a mismatch between the reader's ability and the difficulty of writing is what readable writing is all about. And technical writing, more than most other kinds of written communication, should be readable. (1977, 5)

Edward Fry, who has done a great deal of work in readability, is even more positive about the results of readability formulas.

For those who wonder if educational research ever pays off--I would say readability is a real payoff. It not only has helped millions of students to get textbooks that they can read better, it has helped newspaper readers, insurance policy buyers, readers of consumer contracts, and buyers of new products. In short it has helped every literate person and those about to become literate. (1987, 343)

Rudolf Flesch has been criticized by authors of textbooks and journal articles for creating a readability formula, for putting language into mathematical terms. Yet it is not the formulas that are bad but how they are used. Textbook and journal authors are ignoring Flesch's original purpose of wanting to create a formula that would predict the difficulty of materials aimed at the average adult reader. If they simply state that writers should use short sentences and short words, then they are overly simplifying what Flesch did. They also ignore the limitations that Flesch placed on his formulas when they expect the formulas to work in every situation and for every reader.

Using a readability formula is the first step to knowing your reader since you need to know how well your audience can read. That is why Flesch and formulas are important: not because they can predict readability, but because they force writers to consider the audience and the needs of that audience.

CONCLUSIONS

Perhaps the most important aspect of Flesch's work is that he realized that more work needed to be done in the field. He knew that his formulas could not measure every aspect of difficulty and that even more research was needed.

The direction further readability research could and should take is therefore fairly clear. What is needed is a refinement of the available measurement techniques and the utilization of work in related fields, particularly the psychology of personality. . . . Above all, the problem should be approached not as a problem in education, library science, journalism, or whatnot, but as a problem in linguistics. (1948b, 350-1)

Why do I consider Flesch's desire to know more the most important aspect of his work? Because it is one of the main things that I have learned about readability: I still do not know enough. Since I concentrated so much on Flesch, I have not learned enough about other formulas and research that is currently being done to devise new formulas.

But I have learned that Flesch really cared about his audience and how they wrote and read. He devised a formula that was geared to help the average adult, who at that time had only an eighth grade reading level, learn more about himself and the world around him. He also constantly revised and worked on new and different ways of helping writers write for that adult reader.

Flesch was dedicated to the average adult reader. He felt that even though that adult could not read well, he was still entitled to know what was going on in the world around him. He was entitled to books and articles that would be interesting and yet informative.

When I started this thesis I thought that I would be defending Flesch and proving absolutely that the formulas he devised can be used today in business and technical communication. I felt that the people who were using the formulas were at fault and that the formulas were good. I still think that Flesch was right in what he did and that there is a place for his formulas in business and technical communication. But I am no longer sure that everyone can use the formulas.

My problems are not with the formulas but with how we use them today. Sentence fragments may be found in everyday speech, but they do not seem to fit in the business and technical communications of today. We still use semicolons to connect related independent clauses, but colons are hardly ever used and we would never count the clauses they connect as more than one sentence. But we are all told that our writing should be "you" oriented, and that is what Flesch's Human Interest Score was aiming for.

But perhaps the best reason for still using the formulas (both the Reading Ease Score and the Human Interest Score) is to remind ourselves who our audience is and how they are going to use what we write.

Perhaps some day we will have the means not only of accurately stating the difficulty of a document but also of knowing exactly what needs to be done to make the document readable. But for now, in spite of

the criticisms against readability formulas and Flesch in particular, the readability formulas still hold a valuable place in the prediction of difficulty of a document.

We still have general, average readers who do not have a good education and yet still deserve to know what is going on in their world. Bryson's statements about the adults of the 1940s are equally applicable today.

Many people can read, haltingly, if they must, but they do not have enough skill to enjoy it. . . . And yet these people, millions of them, vote and run machinery and handle dangerous gadgets of a civilization of which they understand very little. . . . there is one thing we can do, and that is to see that a few books on important subjects get written in language that they . . . can follow. More than that, we can see that the books they need to read, the documents they have to understand, the instructions that will keep them out of trouble, are written in plain English. (quoted in Flesch 1946 ix-x)

If we accept the responsibility to inform these readers, then we must also accept the responsibility to write so that they can understand what we have written. It is up to us--educators, writers, people in business, people in science, and people in government--to use the formulas so that those people can have something they will understand; we need to use the formulas only as they were intended and not as absolutes or cures of bad writing.

Selzer stated that the formulas "kill the notion of style as choice" (1981, 32). Yet Flesch states that

The secret of good writing is that you have a choice. At every point you can choose whether to use this word or that, write one sentence or two, say it one way or another. It's up to you to make the best choice. (1962, introduction)

Formulas do not kill style; they let writers know that another choice could be made.

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The numbers before certain entries indicates the categories that they were placed in for the survey of journal articles.

1. Articles that give historical information and/or describe the way a formula was devised.
 2. Articles that support the use of formulas.
 3. Articles that attack the use of formulas.
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APPENDIX: BOOKS USED FOR SURVEY OF BUSINESS, TECHNICAL, SCIENTIFIC
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